



REPORT on the SANITATION
—OF PORT LOUIS—



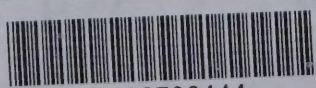
By

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ADDENDA

According to the REGISTRAR GENERAL'S REPORT for 1920, now in the Press, the Death rate for the Port Louis District for 1920 was 47.3 per 1,000.

ADDENDA

According to the Registrar General's Report for 1920,
now in the Press, the death rate for the Port Louis District
for 1920 was 47.5 per 1,000.

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REPORT

ON THE

SANITATION OF PORT LOUIS

No. 57/R/21

GOVERNMENT HOUSE,
PORT LOUIS,
12th May, 1921.

SIR,—I have the honour to submit a report on the general sanitary condition of Port Louis and on the measures required to remedy the present deplorable state of unhealthiness therein.

During the past month the following memoranda have been submitted dealing with the nuisances and defects calling most urgently for action:—

Memoranda
already submitted.

- No. 10/R/1 and 25/R/6.—Markets ;
- No. 17/R/2 and 29/R/8.—Aerated Water Factories ;
- No. 19/R/4.—Municipal Slaughter House ;
- No. 20/R/4.—Roche Bois Sewage Manure Factory ;
- No. 30/R/9 and 43/R/14.—Restaurants and Eating Houses ;
- No. 33/R/11.—Public Latrines ;
- No. 35/R/12.—Hospital Accommodation for Lepers.
- No. 42/R/13.—Bake Houses ;
- No. 44/R 15.—Schools ;
- No. 46/R 16.—Central Railway Station ;
- No. 47 R 17.—Sanitary Control of Port Louis ;
- No. 50/R 18.—Refuse heap, Customs' yard.

In addition a note has been furnished regarding anti-pleague measures and numerous communications have been sent to His Worship the Mayor on the subject of water nuisances, mosquito nurseries and other matters affecting the Municipality.

Communications
addressed to the
Mayor.

It is therefore unnecessary to enter fully into all these questions. This report will deal for the most part with the larger issues requiring attention but brief reference will again be made to the subjects covered by the memoranda and will supplement the latter in certain particulars.

In view of the fact that reports by Chadwick, Bolton, Ross and Fowler are in existence which describe the town and deal with its sanitary history and as Anderson in his "Epidemics of Mauritius" also furnishes information on these matters, I propose to confine myself, as far as possible, to existing conditions.

Sanitary history
not especially
considered.

1. *Streets*.—One of the first things which must strike the visitor to Port Louis is the state of the streets. This is, in part, due to faulty scavenging and the paucity of water carts, and, in part, to poor construction and lack of proper upkeep and repair.

Streets.

The latter factors are the more important for, in the tropics, it is almost impossible to keep streets of the type found in Port Louis in a cleanly condition.

Bad condition of
streets.

In the Panama Canal Zone, in Port of Spain and elsewhere, this fact has been recognised and has been acted upon with most beneficial results.

It is significant that sore-throat is a common complaint in Port-Louis. This condition is frequently associated with dusty and dirty streets while infected dust is, in all probability, a cause of more serious maladies. Moreover it has been found that the habits of a population are more or less in accord with its surroundings. If a populace is accustomed to thorough-fares of a poor type and ill-kept there is no incentive towards cleanliness and decency. Improve its surroundings and its general sanitary tone will also improve. Hence, on all counts, it is most necessary to put the streets of the capital in a hygienic state. I am aware that this will be costly business but it is essential. Fortunately only certain of the main streets require complete reconstruction and once properly laid out the cost of upkeep, will probably be less than it is at present, for durable surfaces will be obtained which will require less attention. Not only so but such a measure will greatly aid the general amenities of the town. A motor drive in Port Louis at present is by no means a pleasant method of progression owing to dust, inequalities of the roads and the necessity for jolting over surface gutters crossing these roads at right angles.

Sore-throat
common.

Effect of insanitary
surroundings on
outlook of
population.

These disadvantages will vanish if the streets are reconstructed and opportunity can at the same time be taken to amend the fall of some of the channels and to deal with the unsuitable type of gullies which disfigure the angles of the thoroughfares and in which all kinds of refuse accumulate.

Advantages of
street-
reconstruction.

In this connection attention may be directed to the Dacca type of rectangular street drain which has several points to commend it. An illustration of this type of drain will be found on p. 5 of Disney's book "Sanitation of Mofussil Bazaars," copies of which are in the possession of the Honourable The Colonial Secretary who obtained them from India.

Streets requiring special attention.

As stated, all the streets in the town do not require radical treatment. It need only be adopted in the case of those where the traffic is heavy. These include, of course, certain of the principal streets. Taking those which run more or less from west to east we have Moka Street, New Moka Street, Chaussée Street, parts of Farquhar and Queen Streets, David Street, Royal Street and Nicolay Road, at least as far as the Latanier River. It seems advisable also to add Desforges Street to the list as a good deal of motor traffic passes along it and it is an important highway. Of streets cutting these at right angles all the small cross roads leading harbourwards from Royal Street should receive attention and it would certainly be an advantage if the approaches to the Central Railway Station, Harbour Square, the Place d'Armes and Immigration Square could be included. In addition to that small portion of it which lies more or less north of Royal Street, the section of Church Street between Royal Street and Dauphine Street should be dealt with.

It will be noticed that only parts of Farquhar and Queen Streets, important thorough-fares, are mentioned. This is because they are already paved to some extent and this leads one to speak of the type of surface desirable.

Advantages of asphalt.

There can be no doubt that, all things considered, nothing is better than Trinidad asphalt. If of good quality and properly laid down it presents a smooth hard face which would not soften perceptibly even at the hottest time of the year in Port Louis. It wears well and is easily repaired. Unfortunately it would here be very expensive and it is a question if its use is justifiable. Further its adoption would lead to considerable delay. Still its employment merits serious consideration and I would suggest that the opinion of the Director of Public Works and of the consulting Sanitary Engineer be obtained regarding it. Wood paving is, I think, prohibitive in cost and concrete-cement is not likely to prove satisfactory. There remains the use of the stone setts (blue basalt) which are already laid in some of the streets, i.e., Farquhar Street and Queen Street. These if carefully laid appear to give a fairly satisfactory surface. Doubtless as the result of detritus they yield a certain amount of gritty dust and when hollows form they are not easily repaired. They have also the disadvantage of making a noisy pavement but they would undoubtedly be a step in the advance of a system now generally prevalent and presumably, if employed, the work can be begun at an early date.

Use of stone setts.

To sum up :—if money is available I am in favour of asphalted streets even if the use of asphalt necessitates loss of time.

Failing asphalt I think stone setts should be used unless there is any objection to them from an engineering standpoint.

General measures for streets.

The smaller and less important streets of course require constant attention and it may be possible to improve them by oiling, tarring or some other method. I am making some enquiries into the means now taken for reducing the dust nuisance in the case of streets in the tropics.

Thanks to the kindness of The Honourable the Colonial Secretary, I have had an opportunity of consulting a useful little book by Disney, who, amongst other matters, deals with road making in India. What he says is so much to the point that I have had extracts typed and they will be found in Appendix I to this report. The surfacing system with Tar-macadam would appear well worthy of trial in Port Louis.

Cleansing of streets.

When streets have been properly paved they can and should be properly cleansed. For this purpose hydrants to which hoses can be fixed should be established at intervals and every night the roads should be thoroughly washed. At present the state of the streets in Port Louis at night recalls mediæval conditions.

Buildings and Housing conditions.

2. *Buildings and Housing conditions.*—Much of Port Louis may be compared to a rabbit warren. Although the town as a whole was originally laid out on good lines it has been allowed to degenerate in a hap-hazard manner. It has suffered from the curse of sub-letting and the lack of proper sanitary control. For years it has been on the down-grade. Old mansions, roomy houses, spacious yards have all deteriorated. Most of the shops and warehouses are poor and dismal-looking places, the majority of the houses have either been turned into insanitary business premises or have been divided up into one-roomed dwellings. Old wooden buildings round the

Deterioration of house property.

sides of yards; originally outhouses, servants' quarters, stables, &c., have been similarly converted. In some instances the centre of the yard has not been left vacant and, as a result, light and air have been excluded. The landlords, as a rule, have adhered to the building regulation which lays down the minimum dimensions of every room intended for human habitation at 10' x 10' x 10'. There, however, the matter rests. There is no limit to the number of occupants. I have found as many as nine in a room of this size. There is frequently no window whatever and back to back premises are not uncommon. It is true that during the day, the occupants are usually elsewhere, the man out at work, the woman washing or cooking in the yard, the children at school or at play. Even if in the room, its door is open and there is some degree of ventilation though in most cases there is little air movement, which recent work has shown to be the chief factor in ensuring health and comfort. At night, however, and I can speak from personal experience, every door and window is closed and the unfortunate people live in a stifling atmosphere under conditions most favourable to the spread of pulmonary tuberculosis and pneumonia and which cannot fail to encourage alcoholism.

Over crowding.

Conditions at nights.

Even in the better-class rooms the amount of air-space is limited, for many of them are half full of furniture which diminishes the amount available.

With the assistance of Mr. A. Walter I measured some of the rooms and, making the usual deductions for furniture, find that the *average* cubic space per head works out at about 200 cubic feet. This is bad enough but far worse is the stagnation of air at night and the general overcrowding.

Observations on ventilation.

As regards the latter Mr. Walter obtained some valuable statistics in the course of his last census work. He divided the town into sections and worked out for each section the density of population. In his tables he gives the population per square mile, and the square yards per person for eleven out of his thirteen sections. The population per square mile, the unit taken being 1,000 persons, is specially interesting and I understand has scarcely changed since the date of the last census (1911). The figures vary from 15.9 for Section I; that in the neighbourhood of and including the so-called "Pleasure Ground" in the west of the town, to 72.1 for section 9; that bounded by the railway to Pamplemousses on the North, Remy Ollier Street on the South, Church Street on the West and La Paix Street on the East. In this area the crude death-rate per 1,000, per annum, was 47.9. Mr. Walter's researches showed a difference in death-rates of 5.7 per 1,000, per annum, in favour of the blocks with densities below 50,000 persons to the square mile.

Density of Population.

Death-rates in relation to density of population.

These are significant figures. Reference should be made to Mr. Walter's reports for further details. (M. P. 2783/15). * Here I wish only to deal for the present with part of his Section 9.

Before doing so it is necessary to say a word about the Common Lodging Houses, many of which exist in this area. They are in most instances scandalous places in which there can be little decency or any of the amenities of life. They are usually filthy, plagued with vermin, rat-ridden, ill-ventilated, dark and dilapidated. It may be said that in a town with a population like that of Port Louis this is unavoidable. The lie direct is given to any such statement by the conditions obtaining on the premises of an enlightened Indian landlord, Mr. Nalamootoo in Mère Barthelemy Street. What he, unaided, has done for the health and comfort of his tenants stands as an example to his fellow citizens.

Common Lodging Houses.

A notable exception.

At the same time few have the public spirit or the economic wisdom of this gentleman and hence it becomes necessary for Government to step in and deal with this dangerous and insanitary section of the town.

It would be well if the whole of it could be handled at once, but, for practical purposes, and on account of its proximity to the area where plague rats are being found, I suggest that the portion north-east of Royal Street be first taken in hand even though some of its blocks are not so overcrowded as those south-west of Royal Street.

I would ask if Government cannot expropriate the greater part of this area, turn it into commodious and rat-proof shops and warehouses and find room for its population elsewhere. The persons evicted would find accommodation in the new model quarter which I propose should be built in one of the healthier areas of the town and they could be given a preemption as regards this new building area.

Expropriation recommended.

Apart from sanitary considerations a scheme of this nature would, in all probability, prove remunerative and return a good interest on the money expended. It would benefit the trade of the town, improve its appearance

Results of reconstructing an insanitary area.

*The Mauritius Almanac for 1921 contains a map showing the blocks with a density of population in excess of 100,000 per square mile.

and mitigate a crying evil. A reconstructed area of this kind would also, to some extent, serve as a bulwark against the spread of plague which must always be a menace to the health and prosperity of Port Louis.

It may here be stated that Indian experience has shown that the following should be the characteristics of a rat-proof godown :

- (1) A plinth 3 feet high
- (2) A projecting ledge of 9 inches at top of plinth.
- (3) A properly laid concrete-cement floor (concrete 3 inches, cement 1/2 inch) and well fitting doors.
- (4) The roof should project beyond the 9-inch ledge of plinth.
- (5) At the site of each door, small platforms with projecting ledges of 9 inches.
- (6) No steps.

In addition the walls, if of hard brick or concrete, should be at least 6 inches thick, and they should extend to not less than 18 inches below the level of the ground floor.

There should be no wholesale grain stores in the reconstructed area. In fact they should not be permitted within the limits of the Municipality.

Difficulty of removing Indian trader from his store.

One difficulty, likely to be encountered, is the great dislike of the Indian to be separated from his business premises. This has proved a stumbling block elsewhere but it can be surmounted if adequate means are taken to safeguard property at night.

Site of new model area.

The question as to where the new quarter of the town should be placed is not an easy one to answer for if some area towards the amphitheatre of hills be suggested its selection or rejection will depend largely on the anti-malarial measures which can be taken to protect it. Furthermore there are questions of water-supply and drainage to be considered.

Signal Mountain or Tranquebar Valley.

Still from what I have seen I should say that the most suitable places are the north-eastern slope of Signal Mountain and the area in Tranquebar Valley between the hill crowned by the Citadel (Fort Adelaide) and Signal Mountain. Owing to the fact that it is closer to the harbour and the business part of the town, this latter area would appear to be more suitable than the Vallée Pitot on the eastern side of Citadel Hill, though otherwise there does not seem to be much to choose between them. Both are highly malarious and in both cases extensive clearing will be necessary (vide infra). The north-eastern slope of Signal Mountain possesses certain advantages. So far as I can tell at present it will be easier to keep it malaria-free than the low-lying land in Tranquebar Valley. Dr. Castel tells me that there should be little malaria in this region. The breeding places of *A. costalis* found here are almost entirely artificial. Such investigations as I have made in the neighbourhood confirm this statement. The only pools I have seen are due to troughs or standpipes leaking into the catchwater drain, to defects in the pipe-line carrying Port Louis water to Monneron Reservoir and nuisance created at the house of the man in charge of the water-supply. The site can easily be drained. There is a fine view from it and it is more airy and generally agreeable. On the other hand the cost of roads required to make it readily accessible would be heavy and extension of buildings upon it is to some extent limited by the presence of the large catchwater drain.

The question of malaria.

Experiments on Signal Mountain.

I think it is wiser to make no definite recommendation on this matter until further information has been obtained. I hope to have mosquito trap-pools placed on the slope of Signal Mountain. This has already been done in the case of Tranquebar Valley and the Vallée Pitot and has led to interesting results (vide infra).

Since the above was written the experiment with trap pools on Signal mountain has been completed. No larvæ of *A. costalis* have been found in them and it would appear that, at this time of the year at least, Signal Mountain and its precincts do not contain breeding places for the malaria-carrying mosquito. Further surveys of both Signal Mountain and the Tranquebar Valley have been made and there can be little doubt that, from a hygienic point of view, the lower slopes of Signal Mountain constitute the better site for building purposes.

Malaria and Anti-Malaria measures.

3. *Malaria and Anti-Malaria Measures.*—These have such an important bearing on the above question that it seems advisable to consider them in the next instance. It may seem surprising that, despite the action taken on the reports of Ross and Fowler, Port Louis is apparently, as much plagued by malaria as it was when their reports were written. I say, apparently, for I am doubtful if this is really the case. It is true that statistics would appear to prove it, but statistics are always apt to be fallacious and, so far as I can see, they have a distinctly limited value in Mauritius. It is the case that in Port Louis they are likely to be more reliable than in

Malaria statistics.

country districts but even here it is clear that the data on which they are based must be very defective. Malaria is almost protean disease. It assumes various forms, may resemble many other diseases and is frequently simulated by other maladies. For example, typhoid fever in the tropics has often been mistaken for malaria, just as malaria has been mistaken for typhoid and, considering the present water supply of Port Louis, a considerable prevalence of typhoid fever would *a priori* be expected.

Protean character of malaria.

It must clearly be understood that malaria can only be definitely diagnosed by blood examination. How often is this carried out in Port Louis? The large Civil Hospital should be a mine of information but what are the facts of the case? There is a room which, while used also for other purposes, functions as a laboratory, but there is no Pathologist or Bacteriologist on the Hospital Staff. That Staff is quite insufficient to cope with the ordinary work of the hospital. It is overworked and cannot be expected to apply, in every case, those diagnostic methods which modern tropical medicine demands and which are indeed essential. It takes at least 20 minutes to examine a blood film *properly* for malaria excluding the time required for making and staining the preparation. It is true that in positive cases the malaria parasite may be found almost immediately, and a diagnosis possessing certain definite value be made, but that is not a complete examination and, as stated, in cases of sparse infection, a slide may have to be searched for 20 minutes. (I am not speaking here of the thick film method which is more rapid. It requires, however, a certain amount of experience and special training). It is obvious that without a proper clinical laboratory and a trained observer accurate work is impossible at the Civil Hospital. The Medical Superintendent is the first to admit it. He does his best and the fault does not rest with him. If this is true of the Civil Hospital it is doubtless still more true in the case of the Dispensaries and of private practitioners.

Necessity for blood examination in diagnosis.

Facilities at present lacking.

It may be said that the spleen index should form a good guide to the amount of malaria present, but our knowledge as regards tropical splenomegaly has increased since the days when Ross visited the island. Personally, in places where worm infection is very prevalent, as in Mauritius, I have always felt doubtful as to the precise value of the spleen test and I see that its validity as a guide to malaria infection has recently been called in question as a result of observations in India. That it possesses considerable value I do not deny but I would not care to rely wholly upon it in an enquiry regarding malaria prevalence in Port Louis.

Spleen index test.

That there is a good deal of malaria in the town cannot be doubted. *Anopheles costalis* still breeds freely in the Municipal area despite all that has been accomplished. This is not surprising for, though much work has been done, both long ago and since the date of Ross's report, in the way of stream canalisation, the upkeep of these great stretches of excellent pavement has not been at all satisfactory. Moreover the "regards" continue to provide mosquito nurseries in abundance and there are all kinds of other water nuisances *i.e.* constant flow from stand-pipes, leakage from broken pipes, garden pools, seepage waters from subsoil spreading over pavé, water collections in hoof-marks, in rain gutters, in barrels and so forth. There is no need to enumerate all of them, but they are very numerous.

Prevalence of malaria and of *Anopheles costalis*

Breeding places of *Anopheles costalis*

Much of this trouble is due to the truly Gilbertian situation which has arisen as a result of dual control in the Port Louis District and the fact that the Municipality possesses no trained sanitary executive. I have dealt with this matter elsewhere (My No.26/R/7 & No.47/R/17) and need not recapitulate, but another reason why this nuisance and danger to health exists lies in the fact that legislation is defective. The only enactments under which action can be taken are the Public Health Ordinance, No. 32 of 1894—95, article 29, dealing with nuisances and the Public Health Amendment Ordinance No. 31 of 1913, article 4, which states that a nuisance includes :

Legislation as regards mosquitoes.

"All collections or accumulations of stagnant water liable to breed mosquitoes, all bottles, whole or broken, all tins and boxes, empty and open, conch shells, broken crockery, jars and all other articles which form receptacles used for water liable to breed mosquitoes, all receptacles used for storing water which receptacles may have been condemned as unnecessary by the Sanitary Authority."

This is not sufficient from a sanitary standpoint, though doubtless of some service.

It is however much more important to have a regulation setting forth that anyone upon whose premises certain of the water stages of mosquitoes are found is liable to a penalty. This means if the larvae or pupae of any species of mosquito are discovered in any kind of water receptacle or collection on any premises, the owner or occupier as the case may be, will be

Necessity for new regulation.

Association of malaria with water supply and surroundings of town.	fined, unless he can establish his innocence. The penalty must not be too trifling and must be rigidly enforced. In no other way with which I am acquainted can the mosquito nuisance be properly dealt with in towns. If a Government Department or the Municipality is breeding mosquitoes, the Department or Municipality is fined; if a private individual is at fault he is punished, whether he be a wealthy owner of property or the poorest of peons. A discriminating magistrate will modify the fine to suit the financial status of the offending party but there should be a minimum penalty. All must be treated alike, without fear or favour, and this will be possible when there is efficient and reliable control and inspection. But there is a larger side to this malaria question. It is intimately associated with two factors (1) the water supply of the town and (2) the immediate surroundings of the latter.
Waste of waters.	(1) Until the constant waste of water which is always going on is checked, breeding places for <i>A. costalis</i> will constantly be in process of manufacture. The radical remedy for this state of matters will be found in the introduction of Mare-aux-Vacoas water. As it will be a long time before this is an accomplished fact it is necessary to provide all public stand-pipes and fountains with a reliable form of automatic tap. The type in use, close to Cassis Church and elsewhere, which I understand can be obtained from the Public Works Department, is apparently strong and effective and can be so fixed that it is not easily stolen. Attention must also be re-directed to the "regards." I would suggest that a conference of sanitary officers and engineers be held with a view of devising some means of preventing the constant nuisance these pernicious contrivances produce owing to blocking by silt. A member of the Municipal Council might be asked to attend such a meeting and, if necessary, a prize might be offered to anyone who was able to submit a scheme or plan leading to marked improvement or total abolition of the nuisance.
Automatic self-closing taps.	
Suggestions as to "regards".	
Risk of immigration of malaria-carrying mosquitoes.	(2) Even if it were possible, as it should be, so to reduce the number of <i>A. costalis</i> in Port Louis that this carrier of malaria was no longer a source of danger there would still remain the risk of infection from outside the town boundaries.
Major anti-malaria works.	Here evidence of Dr. Castel's ceaseless activities abound. Above the points where the paving of such streams as La Paix and Pouce ceases he has been busy training and canalising and getting various water nuisances remedied. The work has undoubtedly been well done in the first instance and has been properly looked after so that it must have had a considerable effect on the incidence of <i>A. costalis</i> in this locality.
Limit to such works.	Unfortunately, however, it is only possible to deal in this manner with a certain area. One cannot canalise a stream like the Pouce to its source at the top of a mountain. There is a limit even to Dr. Castel's activities and the question arises, is there danger beyond this limit? In other words does <i>A. costalis</i> exist in the tangled mass of wood and undergrowth which clothes the north-eastern slope of the amphitheatre of hills which form a picturesque background to the town?
Trap-pool experiments.	In order to obtain definite information on this point I had recourse to trap-pools. With Dr. Castel's assistance these were placed in lines up the Tranquebar Valley and Vallée Pitot, as well as elsewhere. They have shown, as has the discovery of its larvæ in natural water collections, that <i>A. costalis</i> does exist beyond the limit to which major anti-malaria operations have been carried. For example we have found it breeding on the slopes of Pouce Mountain at a spot of 1,204 feet distant from the dam across La Paix stream and separating that stream from the catchwater drain. This is no less than 4,508 feet from the line of Victoria Avenue and 600 feet above sea-level. In all probability it breeds freely all over the densely wooded area specially during the rainy part of the year. Between this area and the town every facility is offered to the enterprising mosquito. We now know that anophelines can travel long distances especially if favoured by the wind and if places providing rest and shelter are available <i>en route</i>. These latter exist in abundance between the base of the hill slopes and the town. There are many trees, there is a good deal of bush, there are Indian and Creole dwellings. There can therefore, be little doubt that mosquitoes find their way into Port Louis via the Tranquebar and Pitot Valleys. There is only one way of dealing radically with such invasion and it may be expressed in one word, clearance. This no new idea as regards Port Louis. Dr. Castel has advocated it in his recommendation that a space of 600 feet be cleared round each house in the above mentioned localities.
<i>A. costalis</i> outside the town.	
Travelling capacities of anophelines.	
Favouring conditions.	
Necessity for Clearance.	This would doubtless be useful but it is not enough. Our knowledge of the capabilities of anophelines as regards flight and immigration has increased of late years and methods once in vogue have been found ineffective.

I would press, if at all possible, for a zone half-a-mile in breadth. I do not think the establishment of such a cleared area would present any great difficulty though it will cost a good deal of money. It is not necessary to cut down the large trees or to destroy the grass. The bush and smaller trees only need be removed and the grass kept short. Within the zone no human habitation should be permitted and there should be no cultivation necessitating irrigation. The outer limit of the zone need not be beyond the base of the hills which lies about 300 feet above sea level. So far as I can tell at present Monneron Hill may remain to a large extent untouched. It is, I think, unlikely to be a fruitful source of anophelines and in front of it stretches the wide area of the "Champ de Mars."*

The limit of the zone on the Port Louis side would be represented by Victoria avenue and its continuation Junction Road. At the western end of Victoria Avenue there is a small triangular patch of bush and trees on the town side of the road which should also be cleared.

The zone can be utilized as pasture land and during the day for purposes of recreation. There would be no objection to building cattle-sheds and pig-pens close to the outer edge of the zone, provided only such attendants as were absolutely necessary to look after the animals lived there.

In fact it would be an advantage to place animals in such a situation. It has been found that anophelines prefer animal to human blood and that cattle, pigs and horses can be utilized as a protective screen. This method of protection has already been employed in certain places with good results.

If the new building area is located in Tranquebar Valley, a development not recommended, its southern edge would coincide with the northern limit of the zone. Two lines of trap pools would be placed in the zone and would not only serve to indicate what was happening in the anopheline world but would prove a valuable anti-mosquito measure. To those unfamiliar with what has been accomplished elsewhere this proposed formation of a zone may seem a very drastic and even fantastic measure but it is nothing to what has been carried out in Italy and other places where communities have seriously addressed themselves to the problem of getting rid of the curse of malaria. It only requires money and energy. It is always easier to destroy than to construct. Clearing operations would be aided by the provision of petroleum fire-sprays. These have proved most useful in the Panama Canal zone and elsewhere. The "Knapsack" type is the most convenient and can be operated by one man. By its use grass is easily controlled and reeds and rushes kept in check. I do not think it would be practicable to extend clearing operations to the Vallée des Prêtres but I am certainly of opinion that it is desirable to interdict any cultivation requiring irrigation within a mile of the town precincts. This may prove to be quite impossible. If so I can only say that, along with the cultivation, there is likely to be a certain amount of malaria. It is perhaps worth mentioning that the City of Khartoum, where the same malaria vector is present, has had good reason to regret the non-acceptance of this principle.

An example nearer Mauritius is to be found in Madagascar as the following extract from a recent paper by Legendre will show :—

PLAN DE CAMPAGNE ANTIPALUDIQUE POUR MADAGASCAR PAR J. LEGENDRE

MESURES SANITAIRES

Interdiction des cultures irriguées.—La suppression de la culture du riz, du cresson et des tarots dans le périmètre urbain, réclamée par moi en 1914, allait aboutir quand un changement de gouverneur arrêta la procédure. La situation n'a fait que s'aggraver depuis lors, la superficie des cressonières urbaines et périurbaines riches en anophélines, n'ayant fait que croître.

Bulletin de la Société de Pathologie Exotique.
Volume XIV No. 2.—February, 1921.—p. 98.

There is one other point deserving attention. It could be a great advantage if acute malaria was made a notifiable disease in Port Louis. Strictly speaking what is required is a notification of all cases of primary locally acquired malaria but the difficulty of procuring reliable histories from the patients would make this impossible. Hence I would confine the notification to cases with definite febrile symptoms even though some of these will be relapse cases. As has been explained, a certain diagnosis cannot be made in the absence of blood examination. Therefore to make the notification of value provision must be made for this examination. It should present little difficulty if the medical practitioners will co-operate in the work. Dr. Barbeau

Cleared zone.

Utilization of zone.

Value of animal screen.

Use of trap pools in zone.

Petroleum fire sprays.

Danger of irrigated areas near Port-Louis.

Example furnished by Khartoum.

Example furnished by Madagascar.

Notification of malaria.

Malaria Diagnosis Centre.

* Trap-pools placed on Monneron Hill have failed to indicate the presence of anophelines.

can easily train some one to do the necessary staining and examination. It is not difficult to recognise the presence of the parasite in stained blood and it would not be necessary for the examiner to pronounce upon the species of parasite present. This work was done on a large scale in South Africa during the late war by women specially instructed for the purpose. Indeed women are better than men for they are more patient and often more careful. I do not suppose a very large number of slides would have to be examined daily and one or two trained women would probably meet the case. They could, I take it, work at the Civil Hospital or in the laboratory at the Medical and Health Department. I do not know if there are women in Mauritius who have received instruction in the use of the microscope. Science students were given the preference in South Africa and if they can be obtained here should be employed.

**Value of Malaria
Diagnosis Centre.**

Such a Malaria Diagnosis Centre would be most beneficial. It would yield valuable information and place the Sanitary Authorities on the "qui vive," for where there are parasites, there are anophelines, at least in the case of primary and of fresh infections. Moreover it would facilitate the proper treatment of cases and a great deal can be done to eradicate malaria by efficient quininisation of "carriers." A much more extensive scheme would be required to do this properly, but, even with its obvious limitations, the measure here advocated would be of value and I have no hesitation in strongly recommending it.

**Summary of
anti-malaria
measures.**

Summing up the situation it may be said that malaria in Port Louis is to be combated by :—

(i) Dealing with the disease by :

- (a) Notification on the lines indicated.
- (b) Systematic blood examination at a Malaria Diagnosis Centre.
- (c) Splenic index investigations as already practised but with direct palpation *i.e.* not through the clothes.
- (d) Routine quininisation of "carrier" cases *i.e.* those harbouring the sexual forms (gametocytes) of the parasites. (These alone are capable of propagation in the body of the mosquito).

**Treatment of
malaria "carriers."**

**Quinine
prophylaxis.**

- (e) Quinine prophylaxis as at present carried out, but on a larger scale, if feasible.

(ii) Dealing with the mosquito vector by :

- (a) Clearance in the Tranquebar and Pitot Valleys on the lines indicated.

Cresol as a larvicide.

- (b) Major and minor anti-mosquito works as at present conducted but with more efficient control and inspection and the use of cresol as a larvicide in certain cases. A mixture of petroleum and castor oil has been advised for general use. It forms a much more effective film than the oil alone.

**Petroleum films im-
proved by admix-
ture with castor oil.**

**Fumigation for
mosquitoes.**

- (c) Fumigation by means of smoke bombs and other methods.

**Trapping of
mosquitoes.**

- (d) The use of aspirators and other devices for catching adult mosquitoes, more especially the infected insects found in and around houses.

**Educational
propaganda.**

- (e) Educational propaganda with a special advocacy of the use of nets and impressing on the users of nets the necessity of keeping them in repair. It is clear that nets will never be generally employed. Many people are too poor to purchase them or too careless to keep them in good order and a defective net is worse than no net at all. At the same time much may be done in this direction in the case of institutions. For example action has been taken at the Sailors' Home and wherever men are under discipline, as at the Fire Station, they should be provided with nets and forced to look after them.

**The use of
mosquito nets.**

- (f) Amended legislation, on the lines suggested.

**General anti-
mosquito measures.**

4. *General Anti-Mosquito measures.*—Adult anophelines are not much in evidence in Port Louis. *A. costalis* is nocturnal in its habits and is usually found in houses only in the evening and at night. It quits the precincts after its blood feed. On the other hand the town swarms with *Culex fatigans* and *Stegomyia fasciata*. These insects are by no means negligible. The latter certainly, the former, in all probability, transmits the virus of dengue fever and, according to Anderson, dengue is not unknown in Mauritius. Of greater importance is filariasis, a cause of periodic fever and of elephantiasis. The carrier of the nematode worm producing the disease is, as a rule, *Culex fatigans* though other mosquitoes are also vectors. Unfortunately all the species of mosquito possibly concerned have never been determined in Mauritius, though Messrs. Grandpré and d'Emmerez de Charmoy have definitely incriminated *Culex fatigans*, and still more unfortunately we know little as to the actual incidence of filariasis. Its presence, however, should

Culex fatigans.

Stegomyia fasciata.

Dengue Fever.

Filariasis.

not be ignored. *Stegomyia fasciata* is the transmitter of yellow fever but the possibility of yellow fever gaining a footing in Port Louis is slight, thanks chiefly to the energetic campaigns of American Scientists in the New World which have resulted in the almost total extinction of the disease. Apart, altogether from their rôle as disease carriers every effort should be made to get rid of mosquitoes for they are a perpetual source of worry and annoyance and cause loss of sleep and energy.

Yellow fever.

Some of the measures advocated for stamping out *A. costalis* will serve to diminish these other mosquitoes but, as it is well known there are for the most part domestic in their habits, special attention must be directed to premises containing stagnant water. It is no use discriminating in a mosquito campaign. Every species must come under the ban of the hygienist.

Campaign against domestic mosquitoes.

5. *Water supply*.—The question of mosquitoes is so intimately connected with that of water supply that it seems advisable to consider the latter in the next instance.

Water Supply.

There are four sources of supply to the Port Louis District, i.e.

Supplies to Port Louis.

(a).—The Grand River N.W. at the spot called the "Digue" where the stream has been dammed and whence the water is conveyed to the town by two sets of water mains called respectively Municipal and Reciprocating, the latter being a supplemental pipe. Both unite on Signal Mountain and the single main thus formed carries the water to the small open reservoir on Monneron Hill. Prior to the junction the Reciprocating Main gives off two branch pipes which supply water to a portion of the western part of Port Louis, as far back as Labourdonnais Street and as far east as Poudrière Street. This supply is intermittent being cut off every evening at eight o'clock. After the junction, the main, *en route* to the reservoir, gives off four small branches, supplying a limited area, bounded on the east by Corderie Street. The supply from the Monneron Reservoir goes to the part of the town east of Corderie Street and is also intermittent for it is found necessary to shut it off for a couple of hours every forenoon.

Grand River N. W.

Branch pipes.

Monneron Reservoir.

As is well known intermittency is an undesirable feature in a water supply.

(b) The Grand River N. W. at a spot much nearer the sea than the "Digue". From this intake water is conveyed to the Cassis district by the Dayot Canal.

Dayot Canal.

(c) Mare-aux-Vacoas. The water from this reservoir supplies only the following places in Port Louis: Fort George, Fort Adelaide, Fort William, Line Barracks, Central Railway Station, Civil Hospital, Public Works Department, Government House, Central Police Station, Prisons, Supreme Court, Colonial Ice Works, Croft, Ah-Kee and Lee Shim's Aerated Water Factories and the Flore Mauricienne.

Mare-aux-Vacoas.

(d) The Calebasses River, where, near the Bois Marchand Cemetery, there is a dam. The water, thus impounded, is led to the eastern precincts of Port Louis by the Bathurst Canal. It is no longer supplied to the Municipal area, but it is utilized at the Abattoir, in Ste Croix, Terre Rouge, in the Vallée des Prêtres and in part of Roche Bois.

Calebasses River and Bathurst Canal.

I have visited all these sources of supply with the exception of (b) which is unimportant. I have seen the Bathurst and Dayot Canals and have traced the Municipal and Reciprocating mains on Signal Mountain and the main supplying the town from the service reservoir on Monneron Hill. Both Grand River supplies are very impure, the stream being contaminated by grossly polluted tributaries in which the clothing of the people of Curepipe, Phoenix, Quatre Bornes, Rose Hill, Beau Bassin and parts of Moka District is washed and which receive contaminated effluents from sugar factories and the washings from impure soil. It is also to a less extent fouled below the junction of the last of the tributaries which joins it above the dam. I found that the employees of the Municipality at the electric power station and at the "Digue" itself have no latrine accommodation. They go to bush and doubtless after rain their deposits are washed into the Grand River if they do not get there more directly! I have suggested to His Worship, the Mayor, that a latrine should be provided below the dam but I must admit that it is unlikely to be used regularly.

Causes of impurity

The analyses of the municipal water supply made at the Bacteriological Laboratory, Réduit, indicate that it is impure and unfit for drinking purposes. Dr. Barbeau has furnished the following information:—

Bacteriological analyses of "Port Louis" water.

An examination of river water taken at the "Digue" on September 9th, 1911, and conducted by Mr. Maya, showed a bacterial content of 750 per 1 c.c. The statement is made that *B. coli*, the usual indicator of pollution, was present in great numbers but no definite figures are given.

Chadwick's time there may have been some excuse for failing to make good owing to the scarcity of funds. This excuse can happily no longer be advanced and if this question of water-supply is settled once and for all on sound lines the benefit to the populace of Port-Louis will be incalculable.

A subsidiary point to which, I see, Chadwick refers is the desirability of providing a sufficiency of public drinking fountains. These are required both for man and beast. The question of aerated water factories in their relation to the water supply will be considered later.

Public fountains.

Public bath and
Wash houses
Laundries
Waste water.

More public bath and wash houses are required and the establishment of small municipal laundries merits attention. These matters, however, and the problem of waste-waters and sullage, in connection with the drainage scheme had better await the arrival of the Consulting Sanitary Engineer for nothing radical can be done at present.

Conservancy.
Three systems in
Port Louis.

6. *Conservancy*.—As here used the term indicates the collection, removal and disposal of excreta and urine. At present three different systems are in vogue in Port Louis:—(a) Water Carriage.—(b) That conducted by the Roche Bois Manure Company.—(c) That carried out by the Medical and Health Department.

I propose to discuss these briefly in the above order.

Water Carriage.

(a) The system of water carriage removal was adopted as a result of Chadwick's reports dated respectively September 5th, 1891, and May 12th, 1892. In these interesting reports he deals with both the hygienic and engineering aspects of the question and much of what he then said is as applicable to-day as it was when he wrote it.

Faulty conditions

Unfortunately it was found impossible to carry out his scheme to its full extent and, as a result, only a portion of Port Louis is sewered. Still more unfortunately, errors were made in the execution of the scheme and in consequence the conditions at present obtaining are far from satisfactory.

I have traced the system from the private water closet and the public latrine to the sewage pumping station and thence to the outfall into the sea which is in the neighbourhood of the old Victoria Fort. I have also had an opportunity of studying various memoranda and much correspondence on the subject, the most recent being contained in File No. 2,506 of July 1st, 1920. Without entering into the engineering side of the question, on which I am not competent to express an opinion, I may point out that the inefficiency of the pumps and the fact that the main leading to the outfall is too small have led to serious defects from a hygienic point of view.

Sewage discharges.

Thus under the bridge in Chaussée Street, crossing the Butte aux Tonneliers Stream, I was shown an overflow which was discharging sewage into the stream. Again at the pumping station a much larger outlet pours a mass of filth into the canal formed by the junction of the Pouce and Tonneliers Streams. The water in this canal is exceedingly foul and malodorous. It is indeed an open sewer and its contents swing up and down with the tide. The incoming tide carries the filth into the town as far as the junction of the two streams. Gases are evolved in the canal owing to the decomposition of the sewage and bubbles can be seen rising and bursting on the surface. The discharge, such as it is, takes place directly into Caudan Basin which communicates with the harbour. Nor is this all. The failure of the pumps to deal with the total sewage, or some defect in the arrangements at the pumping station, necessitates the emptying of a considerable amount of sewage into a large boat which is moored in a small dock adjoining the pumping station and which, when full, is towed out into the harbour where the filth is thrown overboard. A disgusting nuisance has thus been created and the stench from the boat-load of filth is abominable. It is true that its contents are covered by boards before removal but flies have access to them during the loading process and the whole arrangement is insanitary in the extreme.

Nuisance near
Caudan Basin.

Inadequate water
supply for latrines.

Another fault which is apparent is due to the shortage of water supply, or rather to the inadequacy of the service reservoir on Monneron Hill. As a result it is necessary to shut off the water supply to closets and latrines for a couple of hours every forenoon. The consequences may readily be imagined though the nuisance is not so great as would be the case if the water were cut off earlier or later in the day.

The deficiency of water can only be remedied by the adoption of the measures outlined in the section dealing with Water Supply.

As regards the other faulty conditions it may be noted that a new and larger main is to be laid from the pumping station to the outfall and enquiries have been made with a view to increasing the pumping plant.

Remedial measures.

Steps are being taken to extend the sewerage system, and 9-inch pipes are to be laid between Dauphine Street and Desforges Street from and including Little Mountain Street on the west, to and including Arsenal Street on the east.

Whatever is done it must not be forgotten that it will merely form part of the larger scheme for the extension of the sewerage system to the whole of the Municipal area. Hence it is satisfactory to know that the services of a drainage mechanic will soon be available, and that, ere long, it should be possible to obtain the advice of an expert in sanitary engineering.

I have dealt elsewhere (No. 33/R/11) with the subject of public latrines and urinals and have pointed out that there are far too few of these conveniences. The number, served by the water-carriage system, which will have eventually to be erected, must be determined later in consultation with the Sanitary Engineer, but however much these structures and private water-closets are multiplied, there are certain to be places which will continue to be served by the dry system of conservancy. It will be found impossible to introduce water-closets into every type of dwelling and more especially into houses situated at some distance from any line of drain pipes. The provision of public latrines should theoretically meet the wants of the occupants of such houses but in practice this is not the case and it is the general experience that if dangerous nuisance is to be avoided a certain number of pail latrines has to be permitted though that number should be reduced to an absolute minimum. I mention the matter here so that when the sewage scheme is considered as a whole the necessity of providing a few dumping dépôts should not be overlooked. These are places to which the full and covered latrine pails are brought. Their contents are emptied into the drain through a trapped closet or hopper sink and the buckets are cleaned on the spot. With an ample supply of water and deodorants and efficient supervision this method is not productive of nuisance. A design of a dumping dépôt will be found on p. 191 of Clemesha's "Sewage Disposal in the Tropics."

Public latrines and urinals.

Water-closets in houses.

Necessity for dumping dépôts.

It is unlikely that any question will arise as to the ultimate disposal of the Port Louis sewage. Discharge into the sea, apart from the faults above mentioned, the causes of which have been indicated, has, I understand, proved satisfactory. The sewage is not altogether wasted for it forms to some extent food for fish and there can be no doubt that in a place like Port Louis discharge into the sea is the natural and the best means of getting rid of excretal matter and of urine.

Disposal of sewage.

I cannot approve a suggestion which I see has been put forward by the Manager of the Roche Bois Manure Factory that the sewage outfall under the new scheme should be placed at the works of that factory and that, by a system of tanks and filters, the Company should treat the sewage for application to the land. What I have seen of the work of this Company inspires no confidence, and discharge into the sea presents so many advantages from a hygienic point of view that any other method of disposal need not be considered.

(b) I have already reported on the work of the Roche Bois Manure Factory (No. 20/R/4), stating that the contract with the Company should be terminated as soon as possible. On enquiry I find that the work of collection is not properly performed. I have found a cart gathering pails at 3 p.m. and I am credibly informed that premises are frequently neglected and that the system of emptying the contents of one pail into another is often practised.

Roche Bois Contract.

It is very rare, indeed, to find work of this class carried out in a satisfactory manner by contractors. The fact that in many instances pail contents are only removed thrice a week, according to agreement, is very disquieting.

(c) For some time the Medical and Health Department has undertaken pail removal in the case of Government institutions situated in the unsewered area of Port Louis. There has been great difficulty in obtaining labour. In my report No. 20/R/4 of 11th April, I stated that the work appeared to be done in a satisfactory way. This statement, however, must be taken to apply only to the arrangements during transport and at the trenching ground. I found on further inspection that, owing to shortage of labour, it was impossible in some places to ensure a daily removal and hence the system is at present, in some measure, faulty and dangerous.

Arrangements of Medical & Health Department.

Daily removal necessary.

for fires, washing streets and markets, watering gardens and possibly for flushing water-closets and latrines. On enquiry I found that his idea was that "Port Louis" water should be used for these purposes.

**The question of
Bilharziasis.**

**Incidence of
disease in Port
Louis.**

From a hygienic standpoint I am opposed to any such arrangement. It would be expensive to chlorinate water intended only for such purposes and yet no Sanitarian could view with equanimity the continued employment of impure water within the Municipal Area. It is all very well to call it non-potable, but it is sure to be drunk by certain sections of the community. Moreover there is another aspect of the question. The disease known as Schistosomiasis or Bilharziasis occurs in Mauritius. Dr. Momplé informs me that persons residing at Beau Bassin and Rose Hill who were in the habit of bathing in a tributary of Grand River N.W. became infected. Although exact data are lacking and though we do not yet know the snail-host of the embryo of the fluke causing the disease, we may, I think, take it that the Grand River system is infected. Doubtless the infection is slight, but in the present state of our knowledge, it would certainly be an error to sanction for the watering of gardens the use of a water containing cercariæ of *Schistosomun hæmatobium*. It may be said that if there were any real danger the disease would be much more common in Port Louis than it appears to be the case*. At the same time enquiry shows that our knowledge regarding this incidence in Port Louis is defective. In Cairo unfiltered water from the Nile supplied to gardens was found to be a source of the disease and there is no assurance that conditions as regards Grand River N. W. may not grow worse. Therefore on this and on other grounds I would advise against the retention of Port Louis water for any purpose once Mare-aux-Vacoas water is available; provided, of course, that the latter can be supplied in sufficient quantity to furnish the necessary 30 gallons per head per diem.

**Precautions if
"Port" Louis water
retained.**

Apart from these hygienic objections it is clear that there are objections to having a double set of water mains and of water pipes but it is not my province to deal with the engineering aspects of the question.

If it is found absolutely necessary to retain Port Louis water for non-potable purposes the danger of Bilharziasis must be carefully considered, for ordinary water chlorination such as will destroy the organisms of typhoid fever, dysentery and cholera is not lethal to the cercariæ of the fluke. Storage, would be required. The cercariæ perish if they do not reach a human host in 48 hours.

Nowadays chlorination is often combined with mechanical filtration which is largely employed, and, if properly supervised, gives good results. Mechanical filters are cheaper to instal than sand filter beds, they occupy much less space, they are easily housed and give a much more rapid delivery of water. With storage, chlorination and mechanical filtration there is no doubt that Grand River water could be rendered a perfectly safe, permanent supply but the necessary works would be somewhat expensive, for settling tanks would be required to deal with the water when it is charged with soil washings after heavy rain.

**Water of Dayot
and Bathurst
Canals.**

The water supplied by the Dayot Canal, being taken from a point still further down stream, and after the depleted river has received more pollution, is naturally worse than the "Port Louis" water. Moreover it is exposed to contamination during its course along the Canal for the stone covering of the latter has been removed at many points and all manner of filth is liable to find its way into the aqueduct. The same is true of the Bathurst Canal. The water which it conveys is impure at the start and becomes more so *en route*. Both these supplies should be discontinued and replaced in the first place by chlorinated Port Louis water and thereafter by the Mare-aux-Vacoas supply. If the cost of piping renders this prohibitive then a small chlorinating plant should be placed at each intake, access to the lumina of the canals prevented during their courses and standpipes erected where necessary.

**Bacteriological
analyses of Mare-
aux-Vacoas water.**

The Mare-aux-Vacoas water after occasional treatment by the Anderson's process and constant sand filtration is of good quality. Dr. Barbeau has furnished me with the following information regarding it:

Bacteriological examinations are made quarterly. It appears that the bacterial count usually is somewhere between 400 and 600 per 1 c. c. though on one occasion, July 18th, 1919, it was as low as 26. It has also (January 13th, 1919) been as high as 1667. On this occasion *B. coli* was present in 50 c. c. The important point to note, however, is that, as a rule, *B. coli* is absent from 100 c. c.

I notice that in every instance the water sample was taken from a tap at the Réduit Laboratory. There is no objection to this procedure, but it would certainly be useful to have more extended observations.

*During the last 3 years 41 cases of Bilharzial disease from the Port Louis District have been treated in the Civil Hospital Port Louis.

Before Mare-aux-Vacoas water is supplied generally to Port Louis I would like to see both bacteriological and chemical analyses of samples taken from the Mare, of samples taken at the filter beds prior to filtration and of samples secured after filtration. Indeed this work will be necessary in order to determine the number of extra filter beds required. I visited the plant the other day but the overseer in charge could not give me information as to the rate of filtration. I hope to obtain data from the Director of Public Works Department. (Information has now been furnished me showing that the rate of filtration is approximately $2\frac{1}{2}$ inches per hour which is quite satisfactory). Meanwhile I would merely again point out that the staff of the Bacteriological Laboratory cannot possibly undertake the examinations which I think are required.

Necessity for more extended investigations.

It is essential that the Staff be increased both on its chemical and bacteriological side.

I may say that Dr. Barbeau fully realizes this necessity. I see that in his memo of May 16, 1914, he refers to the presence of bad smell and slime in Mare-aux-Vacoas water at time of drought. The cause apparently is not clear and should be the subject of investigation though I understand that the measures already taken have served materially to diminish the nuisance.

Question of rate of filtration.

When visiting the aerated water factories supplied with this water I was informed that they could not bottle it direct owing to a certain amount of deposit. This is unfortunate as the interposition of any kind of small filter is undesirable. It would seem likely that the trouble arises from the pipes. When the new works are undertaken it would be well to ensure that all water-pipes are thoroughly scoured.

Deposit in water pipes.

Many pipes, now supplying Port Louis, are in bad condition and will have to be replaced. This change will require the advice of a sanitary engineer. When the Mare-aux-Vacoas supply is arranged care should be taken to see that it is constant. Intermittent supplies are unsatisfactory. It is true that a constant supply necessitates strong fittings and that all taps must be "screw-down" but the greater expense involved is amply justified. The risk of waste can be minimised by the use of modern waste detectors. An intermittent supply leads to:

Leaking water pipes in Port Louis.

Constant and Intermittent Supplies.

Disadvantages of Intermittent Supply.

(a) Storage of water in house and on premises, a practice to be discouraged as much as possible in a place like Port Louis.

(b) Corrosion of pipes. The fact that the present supply is intermittent is probably one reason why so many of the water pipes are defective.

(c) Greater danger of sewage from faulty drains being sucked into defective water mains.

(d) Delay in extinguishing fires.

In the lay-out of the pipes "dead-ends" should be avoided as much as possible and where they do exist scour valves should be provided. The great point is to keep the water in the delivery area in constant motion. Another matter worthy of mention is the necessity of laying water mains, and more especially water pipes, a sufficient distance below the surface of the ground. Unless this is done, the water in a place like Port Louis, will, during a great part of the year, reach the consumer in a warm condition which he is not likely to appreciate. The question is of some importance from a hygienic standpoint. The principle of laying water pipes at a sufficient depth was overlooked in the case of a pipe installation in India and the result was that the native population, disliking the tepid fluid supplied, had recourse to the cool water of wells which was infected with cholera and which the pure piped supply was intended to replace. I had intended entering more fully into the question of water waste in Port Louis and the method of distribution of Mare-aux-Vacoas water but after studying the two reports written long ago by Chadwick and dated respectively July 23rd, 1891, and September 22nd, 1892, I find there is little for me to say. He explains the obnoxious "Prise" system and suggests remedies for it. I can only say that it is a thousand pities that his sound advice was not taken at the time. Those who failed to adopt it have, if still alive, a grave responsibility on their shoulders for its neglect must have occasioned the deaths of a very large number of people and has undoubtedly been responsible for much sickness and economic loss.

Avoidance of "dead ends."

The "Prise" system.

I am in agreement with everything that Chadwick says about water distribution. I believe that constant supply without control is, as a rule, best together with the imposition of a general water rate. The conditions in Port Louis are, however, exceptional and may necessitate the general installation of measuring meters. Here, however, I trench on the domain of the Sanitary Engineer and so would merely conclude this section of the report by saying that I earnestly trust the mistakes of the past will not to be repeated. In

Water distribution.

An examination, also by Mr. Maya, of water from the Monneron Reservoir collected on March 6th, 1911, showed a bacterial content of 1,050 per 1 c.c. and the presence of two strains of *B. coli* but in what quantity of water is not stated.

An examination of the water of the Dayot Canal made at the same time gave a bacterial content of 3,200 per 1 c.c. and indicated the presence of *B. coli*, but again the number of *B. coli* is not stated. One strain isolated was apparently lethal to guinea-pigs.

Analysis of
Bathurst Canal
Water.

Two examinations* of water collected from the Bathurst Canal on July 18th, 1911, gave respectively counts of 14,100 and 33,300 per 1 c. c. and it is stated that the greater part of the organisms present were of the *B. coli* type.

An examination by Dr. Barbeau of a water sample taken from the Bathurst Canal on January 8th, 1913, yielded a bacterial count of 1,433 per 1 c. c. and *B. coli* was present in 1 c.c.

An examination by Dr. Barbeau of a sample of "Port Louis" water taken from a private tap at Wellington Street, on October 24th, 1921, gave a count of 767 bacteria per 1 c. c. but there is a note that liquefying colonies interfered with the count. Nothing is said regarding *B. coli* but a bacillus of the paratyphoid group was isolated.

An examination of water from the Monneron Hill reservoir, at the same time, showed a bacterial content of 1,150 per 1 c.c. and the presence of a bacillus of the *B. cloacae* type in 100 c.c. Nothing is said regarding *B. coli*.

Paucity of
observations.

So far as they go these analyses certainly indicate that "Port Louis" water, whether from the "Digue" or from the Dayot Canal, is not suitable for drinking purposes, but isolated observations of this kind are not sufficient to give full information on the subject. It is true that confirmation is found by an examination of the source of supply and, so far as the Dayot Canal is concerned, the conditions governing distribution.

Questions of self-
purification of
Grand River water.

At the same time, to obtain satisfactory knowledge, regarding this water, it would be necessary to conduct a regular series, both of bacteriological and chemical examinations for a period of at least a year so that variations due to climatic and other conditions might be noted. It seems probable to me that a good deal of self-purification must take place in the Grand River N. W. between the point where its last tributary joins it and the spot where it is impounded, for here there is not the intense pollution which occurs higher up. I think it is possible that "Port Louis" water is not so bad as has sometimes been assumed. Still the conditions under which it is collected make it essential that it should be purified especially at certain seasons of the year.

The water of Bathurst Canal is undoubtedly impure and liable to frequent pollution. The bacteriological evidence, however, is apparently very scanty.

Inadequacy of
Laboratory staff
for the proper
conduct of water
examinations.

I would like to point out, in this connection, that the Staff of the Bacteriological Laboratory is far too small to enable systematic water work to be conducted. Such work takes a great deal of time and uses up a great deal of material. It is clearly quite impossible for Dr. Barbeau, under existing conditions, to arrange for the routine investigations, both bacteriological and chemical, which should certainly be made.†

Necessity of
supplying pure
water.

The sooner Mare-aux-vacoas water is supplied to Port Louis, the better, but this will obviously almost certainly necessitate an increase in the number of filter beds at the water works. It would be a grave error to force these beds when supplying a greatly increased number of consumers, a fact fully recognized by the Director of Public Works. We are, therefore, faced with the necessity of doing something in the meantime to render the Port Louis supply potable. This can easily be accomplished by means of chlorination, that is by sterilization with chlorine gas. A chlorinating plant, preferably perhaps Paterson's "chloronome" system will not be very costly and will be found quite effective if properly managed.

Increase of filter
beds.

Chlorination as a
temporary measure.
Chloronome
system.

The method is known as water disinfection by liquid chlorine, the liquefied gas being stored in steel cylinders. From these the chlorine issues in gaseous form and passes, via a mixing tower, to the water which it is required to purify. The attached pamphlet, Appendix II, gives full particulars and I can recommend the Paterson Engineering Co. Ltd., whose work is highly esteemed by the leading expert on water purification, Sir Alexander Houston, Director of Water Examination, Metropolitan Water Board.

* The method of examination followed by Mr. Maya is not wholly in accordance with the usual English and American practice

† It is hoped, however, that arrangements may be made whereby the Bacteriological Laboratory will be relieved of the routine chemical analysis of food-stuffs which it now conducts.

If this can be accomplished it should be possible for the staff to conduct, for the period of six months, fortnightly bacteriological and chemical examinations of Grand River water which should furnish the necessary information.

I suggest that full particulars regarding the Port Louis supply be obtained and the information submitted to this firm who should be asked to quote for a suitable plant.

I do not know if Mauritius possesses any expert water engineer, familiar with water chlorination who would be able to advise on certain points in this connection. If so, well and good. If not, it might be worth while considering if the Durban Corporation would not lend one of their water engineers for a short time so that no mistake might be made in the details of the requisition. It may be asked "if chlorination is so effective why not employ it as a permanent measure and continue to use Grand River water for Port Louis?" There is something to be said in favour of such an argument but it should always be the rule to reject an impure source of supply if a pure source is available. As Mare aux Vacoas water is readily obtainable and, as there is, I understand, sufficient of it to supply the needs of the capital I have no hesitation in stating that it should be used.

Expert advice.

Apart from any question of pure or impure water; it should be noted that the dam at the "Digue" is old and leaking and that fears are entertained for its safety. If, therefore, the Grand River supply were retained as a chlorinated supply it would probably be necessary to execute expensive repair works. It would be much better to spend the money on new filter beds for the Mare aux Vacoas water.

Leaking dam at "Digue"

Moreover chlorination, though excellent and effective, must depend on the supply of cylinders of the liquid gas from England. Accidents might happen which would interfere with the process and these risks should not be run when it is a question of permanency. Though chlorination of the Port Louis water is only recommended as a temporary measure, the chlorinating plant need never be discarded. It is certain to be of great service always in a country like Mauritius and I shall have occasion to refer to it again when dealing with other water supplies of the island.

Chlorinating plant certain to be always useful in Mauritius.

I can commend it as a perfectly safe and sound investment and trust it will be secured with as little delay as possible.

I may add that water properly chlorinated possesses no taste or smell, that its colour is not changed and that it produces no ill effects. The method is in use to-day in many parts of the world, the plant nearest Mauritius being that at Durban which, I believe, is giving complete satisfaction. The question arises as to where the chlorinating plant should be placed. As a branch pipe from the Municipal main on Signal Mountain supplies the western portion of Port Louis with water it must obviously be located beyond this offtake. This being so I am of opinion that it should be placed at the "Digue" itself, the chlorinated water from the mixing tower being passed directly into the municipal and reciprocating mains just below the intake. This will ensure thorough mixing before the water reaches Signal Mountain.

Site for chlorinating plant.

The Service Reservoir on Monneron Hill is very small. It only holds sufficient water to supply the town for 24 hours under existing conditions. It is true that, owing to the system of stand pipes and "regards" now in vogue, there is an enormous amount of waste but the total capacity is only 155,805 gallons.

Service Reservoir inadequate.

When Mare-aux-Vacoas water is supplied an effort should certainly be made to provide 30 gallons per head per diem to a population of 50,000, this including the needs of shipping in the port. Thus storage for 1,500,000 would only provide for a day's supply and it is certainly wise in the case of every large town to arrange for several days' supply in its service reservoirs. A few years ago the city of Durban suffered from a serious water famine owing to the bursting of its water mains as the result of heavy floods and the fact that its service reservoir was inadequate.

Need for new Service Reservoir.

Doubtless the risks of a calamity of this nature occurring in Mauritius are slight but it is advisable to take precautions and provide a covered reservoir that will be capable of holding at least 3,000,000 gallons. (It is interesting to note that, after making the above calculation, I found that Chadwick in his "Further Report on the Water Supply of Port Louis," dated September 22nd, 1892, advocates the same figure. The population was considerably larger at that time but, with the lapse of years, our ideas as regards water supplies have become more liberal and I think the amount recommended is reasonable.)

Capacity of new Service Reservoir.

The advice of the consulting Sanitary Engineer should be sought as to the feasibility of enlarging the existing reservoir. It might be better to build a new large reservoir elsewhere.

The question of service reservoirs leads one to consider whether or not the supply of Grand River N.W. is to be retained after the introduction of the Mare-aux-Vacoas water. In a memorandum to the Colonial Secretary dated April 25th (AP/377) I noted that His Worship, the Mayor of Port Louis, speaks of preserving municipal mains for the purpose of furnishing water required

Retention of "Port Louis" water for any purpose dangerous.

Faulty private
public latrines.

Receptacles
unsuitable.

Plans not sub-
mitted to Sanitary
Authorities.

Difficulty of
conservancy work
on a large scale.

Possible necessity
for introducing
sweepers from
India.

Quarters for
conservancy gang.

Improvement of
latrines.

Responsibilities of
landlords.

"Double pail"
service.

Trenching grounds
at Fort Victoria.

It would be so, however, in any case, owing to the class of latrine, both public and private, which is found throughout the unsewered parts of the town and the wholly unsuitable type of receptacle employed. This leads me to speak of the prevailing conditions. The latrine buildings are in most instances quite unsuitable and not infrequently are in a ruinous condition. The seats are often filthy, badly constructed and their openings are much too far above the tubs. This leads to fouling of the edges and sides of the latter and of the latrine floor both with excreta and urine. The tubs themselves are entirely unsuitable, being of a bad shape and constructed of wood. Even if they were carefully and regularly tarred they would infallibly be foul. As it is they are generally in a disgusting and dangerous mess.

I have actually seen a fowl standing on a latrine seat and pecking fly maggots out of the contents of a tub.

This occurrence, of which a photographic record was obtained, took place on school premises. I am informed that it is by no means uncommon.

Owing to the fact that no plans of premises are ever submitted to the Sanitary Authorities the house latrines are placed in all kinds of odd corners.

Chadwick's sage advice on this matter has been ignored, and, as a result, access to many of the latrines is difficult. During the night, the time when removal of tubs should take place, it must be in a good many instances impossible for the latrine can only be reached through the yard, which is either guarded by dogs or the door of which is locked. This is no doubt one reason why the ox-carts of the Roche Bois Company perambulate the streets at all hours of the afternoon, much to the satisfaction of a cohort of flies. The Medical and Health Department will be faced with no easy task when it takes over all this conservancy work. The Acting Director informs me that he can provide the material but he has no assurance that he will be able to obtain the labour now employed by the Roche Bois Manure Company. It is nearly impossible to get men locally to carry out the work and those who can be secured are naturally a very poor class. I am inclined to think that it will be necessary to import sweepers (Methers) from India. These men, of course, are of a special caste and do not find conservancy duties repugnant. They were introduced into Mesopotamia in large numbers during the war and proved invaluable. There can be no doubt that the presence of a corps of sweepers would make a great difference to the efficiency with which the work could be conducted. In any case it is very important to provide quarters for the conservancy gang. Experience has shown that this is a most important matter. If the men live scattered about the town they evade their duties. They must be under a certain amount of discipline and that discipline can only be properly exerted when they are, as it were, in barracks.

When the Medical and Health Department takes over the work every effort should be made to improve the latrine conditions in private houses. Plans of streets and houses must be studied and the existing fault steadily remedied. Latrines must be made readily accessible during the night and their structure must be improved, pending the conversion of some of them at least into water-closets. Stringent action will have to be taken and the landlords who, generally speaking, are, I believe, a very wealthy class, must be made to shoulder their responsibilities.

It is perhaps not necessary here to enter into the question of the type of latrine seat and receptacle which should be adopted. These will vary somewhat according to the habits of the users and will require careful consideration. The matter has already been discussed with Dr. Momplé. What is called the "double" service of pails will have to be used and the buckets must be covered. The method of transport must be by carts and the type of cart has to be selected. Those used at present function fairly well but are much too small for work on a large scale.

All these details can be settled later but something must here be said as regards the method of disposal of pail contents.

At present these are trenched on a small area of Government land just behind Victoria Fort. The ground is not level but it is porous and, though rather stony, has proved suitable for the purpose. It is, however, very limited in extent. The tubs after being emptied are washed in the adjoining sea. So far the operations have not been productive of any nuisance. Flies are not breeding out in the trenches.

pigs have not gained access to them, the foreshore has not been fouled. This is satisfactory but, unfortunately, there is reason to doubt if the system can be extended in this locality. The neighbouring level land belonging to Government, though sufficient as regards area, is so rocky and stony that fears are entertained that it cannot be trenched. The matter requires further investigation. Even were it suitable, however, it is a question whether the trenching system should be continued. There is a stone jetty hard by which could easily be enlarged and on which it should be possible to construct, at comparatively small expense, a dumping septic tank. There is an ample supply of water in the vicinity and the effluent could be discharged by a pipe into the sea. A road could be constructed to the jetty or a light railway laid from the existing road and the pails transferred from the carts to trollies. This system would save in labour, would be cleanly and should be free from nuisance which is rarely if ever true of a large trenching ground. At least it merits serious consideration.

Difficulties in
extending
trenching area.

Provision of
dumping septic
tank.

The only other point to which I would allude under the heading "Conservancy" is the question of dealing with the dejecta of the inhabitants of scattered locations in the Port Louis District; places so out of touch that they could not easily be served by the pail system. For these the system of "fuming pits" might well be adopted. The latrine is in the form of a deep trench, covered over save for the necessary openings which, when feasible, are guarded by special means to prevent the ingress of flies. Communicating with the latrine trench by means of a smoke flue is a pit in which such refuse as cane trash &c., is burned, the fire being fed frequently so that it smoulders all the time. The smoke emitted passes to the latrine trench and effectually keeps away flies. When the contents of the trench reach to within three feet of the surface, the trench is filled up and another dug. After six months or so the contents have undergone resolution, are harmless, inodorous, and can be used as manure.

Conservancy of
scattered locations.

Introduction of
"fuming pits" or
smoke latrines.

I merely mention this method here. It will form the subject of further comment when I come to deal with the rural districts.

7. *Refuse.—Its Collection, Removal and Disposal.*—This is a very important matter in a tropical town like Port Louis for in hot countries decomposition is rapid and vegetable débris, house and market refuse of many kinds and street sweepings quickly become offensive, attract flies and also afford food for rats. Speedy and systematic collection and removal is therefore essential.

Refuse.

Necessity for
improvement.

Unfortunately it is not forthcoming in Port Louis and it never will be forthcoming until the sanitary care of the town is in charge of an efficient Medical Officer of Health aided by energetic, qualified Sanitary Inspectors.

One need scarcely detail the existing faults; the inefficient scavenging, the piles of garbage littering the streets, especially at night, the shocking state of the markets, the uncovered condition of the refuse carts permitting their contents to be blown out of them, the state of private premises and waste plots of land.

Faulty conditions.

What refuse is collected goes eventually to Roche Bois Manure Factory, there to breed flies, to be mixed with human excrement and to be converted into the compost which fertilizes cane-fields.

Present method
of disposal.

A radical change is required, and, as already stated, it will never be properly accomplished until the streets themselves are put into a sanitary state.

Still much may be done by enforcing regulations and by the supply of large covered dust-bins within the town area. I do not know a better pattern than that employed in Port of Spain, Trinidad and of which I can furnish an illustration. These dust-bins should be freely supplied, set on concrete cement plinths, placed well away from dwelling-houses and must be emptied at least once a day. The question of small dust-bins for the use of house-holders is always a difficult question. If anything of monetary value is adopted it is apt to be stolen. It would be well for the Sanitary Authorities to fix on a definite pattern, have a large number made and let house-holders apply for them. They might be marked or numbered to lessen the risk of theft.

Provision of large
sanitary dust-bins.

Small dust-bins.

Those who did not wish to go to the expense of purchasing small bins would have to carry their refuse to the large receptacles provided by the Health Department. In certain places sacks fitted with self-closing lids might be used with advantage.

Refuse carts should be covered. I understand that at present there are too few to serve the needs of the town. I would, therefore, point out that the capacity of each can be increased by heightening its sides. This is done by means of rabbit-netting stretched between upright metal rods in the form of a screen.

Refuse carts to be
covered.

There are two ways in which the disposal of town refuse might be effected :

Final disposal of town refuse.

(a) By placing it in hopper barges, towing these out to sea and discharging beyond the harbour precincts. I fear this would be expensive and moreover it is very probable that a nuisance would be caused at the place of loading.

Provision of Destructor.

(b) By burning in a Destructor. This is the usual method of dealing with town refuse and it has many advantages, amongst others being the fact that there is some return in the way of slag which can be employed for various purposes.

Horsfall pattern recommended.

A "high temperature" destructor, say of the Horsfall pattern, with forced draught would meet the case, but the views of the Consulting Sanitary Engineer might, with advantage, be obtained as regards the type. I mention the Horsfall because I know it best and have found it satisfactory.

Site of destructor.

The destructor must be placed in some spot where it is readily accessible, but where it is well removed from habitations. I should say the area of land near Victoria Fort, if not used as a trenching ground would be very suitable, but it is possible that the eastern side of the town may afford a better site. Until such a large destructor is available, the Medical and Health Department, on taking over the work, will have to do the best it can. A good deal can be accomplished by means of small incinerators and there are other methods, notably the superficial firing method, introduced for horse manure by Carter in Panama, but which can be adapted to refuse generally. This and other points I propose to discuss fully with Dr. Momplé.

Temporary measures.

Food and Drink.

8. *Food and Drink.—Preparation and sale of.*—These are matters of vital importance and merit careful attention especially in a town where typhoid fever, diarrhoea, dysentery, leprosy and beri-beri occur and in which worm infections are common.

I have already submitted several memoranda on the subject (Nos. 10/R/1, 25/R/6, 17/R/2, 29/R/8, 19/R/3, 30/R/9, 43/R/14, and 42/R/13) hence it is unnecessary to go into details but a few remarks may be made under the following headings :

Slaughter House.

(a) *Slaughter House.*—In addition to the recommendations made in my No. 19/R/3 of the 9th April, it is necessary to consider what should be done as regards the disposal of the effluent from the killing booths and the cattle fair. In the first place arrangements must be made to collect the manure separately so that it is not washed as at present into the gutter, down which it passes in a semi-liquid condition to a curious open pit provided with perforated metal baffles in which it deposits, creating an abominable nuisance and becoming a breeding place for flies.

Manure Nuisance.

The manure should be properly stacked and fly breeding prevented by covering the mass with oiled earth, one measure of heavy oil to 40 measures of dry earth or sand.

Disposal of manure.

There should be so-called "working face" to which the fresh layers are daily applied, the earth coating to the top and sides being continued as required.

The liquids from the slaughter house are probably best dealt with in a closed septic tank the effluent from which can be led to an absorption pit.

I fear the tank will be necessary, as, if an absorption pit alone be installed, it will soon clog owing to the nature of the liquids it would receive.

Markets.

(b) *Markets.*—I am sorry to say that little has yet been done in the way of improving the markets although the Mayor has taken considerable interest in the matter. The Central Market is still in a disgraceful state though the persistent use of cage traps and tangle-foot wires seems to have brought about some diminution in the number of flies. At any rate nearly 200,000 flies have been taken in the traps and, in addition, the wires have caught many thousands. These, however, are merely palliative methods. The fly breeding places may be destroyed and the whole place renovated and altered on the lines suggested. I find that writers in 1854 and 1866 comment on the cleanly state of the markets of Port Louis. There is no reason why they should not speedily regain their old reputation.

Anti-fly campaign.

Shops.

(c) *Retail Shops* for sale of foodstuffs. On the whole these are fairly good. I was agreeably surprised at the condition of the small butchers' shops.

Bake houses.

(d) *Bake Houses.*—Some of these, as already noted, are very unsatisfactory. Regulations based on the Egyptian Model Conditions should be introduced as soon as possible. I have commented on the sale of stale and musty bread. This should be put down with a strong hand. Any tampering with the bread supply is a serious matter and calls for stringent action.

(e) *Restaurants and Eating Houses.*—I am glad to be able to report that the Flore Mauricienne has seen the error of its ways and that its kitchen is now kept in a cleanly condition. All these places, however, require to be kept up to the mark for they are very apt to become disseminators of disease.

Restaurants and
Eating Houses.

(f) *Aerated Water Factories.*—The bacteriological analyses of soda waters from the unsatisfactory establishments described in my No. 17/R/2 of 9th April and 29/R/8 of 16th April did not reveal the presence of lactose fermenters in 100 c.c. This is rather surprising, considering that some of them use "Port Louis" water and that their filters were in a foul condition and of a bad type. Still it would be necessary to carry out a series of investigations on soda waters and other products before expressing any opinion on the quality of the so-called mineral waters.

Aerated water
factories.

The results in no way discount the remarks I made on these places and they should speedily be brought under regulations based, as far as possible, on the Egyptian Model Conditions.

(g) *Milk supply.*—The milk supply of Port Louis is all brought into the town which contains no cow-sheds, dairies or milk shops. I understand that it is purchased by middlemen or agents of butter factories from the Indian cow-keepers. The middleman mixes the fresh milk with separated milk from butter factories, boils the mixture and sells the latter through the agency of milk vendors as skimmed milk. The butter factory agents convey the fresh milk to the factories for conversion into butter. The trade is open to all kinds of abuse, the milk being usually "doctored."

Milk supply.

The Milk trade.

It is clear that the product sold as milk in Port Louis is very far from being a genuine article and the ingestion of such "milk" must have a deleterious effect in the case of infants, young children and invalids, even if, owing to the fact that it is boiled a certain degree of safety against diseases conveyed by contaminated milk is ensured.

Sophisticated milk
in Port Louis.

The only satisfactory feature of the affair is that the tins in which the vendors carry their milk are of a good design and appear to be kept clean, though it is probable that they are often washed with impure water. The finding of a remedy for this state of matters is by no means easy and cannot here be considered as it will be necessary to go fully into the whole question of milk supply. I hope to do so in due course and have already commenced an inspection of cow-sheds at Beau Bassin where the conditions are far from satisfactory.

Milk tins
satisfactory.

Necessity for full
enquiry.

9. *Disinfection.*—It is unnecessary to say much on this question as regards Port Louis for the town is fortunately in possession of an excellent disinfecting plant, there being two steam pressure machines, one a Geneste-Herschel, the other a Manlove-Elliott. The latter is a vacuum apparatus. The disinfecting station is well situated for dealing with port work and, though small, appears to meet local needs. It is well kept and must render good service. The only suggestion I have made to the Acting Director, Medical and Health Department, is that some economy might be effected by using for small articles, one of the new Lelean Steam Sack Disinfectors which are cheap, simple and work well.

Disinfection

Good disinfecting
station.

Steam sack
disinfectors.

On the score of economy cresol might be employed as a disinfectant instead of cyllin and, to be in accord with recent views, it would be well to discard fumigation except for purposes of desinfestation i.e. destruction of insect vectors of disease (mosquitoes, fleas, lice, bed-bugs, &c.) and for killing rats.

Use of cresol.

The use of soap and hot water, the free admission of sunlight and air and thorough lime-washing together with attention to the patient and his immediate surroundings i.e. clothing, utensils, &c., are far more efficacious measures than the old-fashioned fumigation of rooms.

Uselessness of old
method of
fumigation.

10. *Vermin.*—In my note of April 20th (No. 32/R/1) I have dealt with the question of rats in relation to plague. Tangle-foot traps have been used and have acted fairly well though cage trapping which is extensively carried out by Dr. Keisler is more effective. There are two small portable Clayton machines and one large apparatus for ship work. As one of the former is out of order it is a question whether it might not with advantage be replaced by the new hydrocyanic acid gas fumigator designed by Colonel Glen Liston, I. M. S., and which is being placed on the market. The matter is being considered by Dr. Momplé.

Vermin.

Rats.

Fumigation with
hydrocyanic acid
gas.

I understand that lice, the carriers of typhus, trench and relapsing fevers, are very prevalent in Port Louis though no definite investigations appear to have been made regarding their distribution. It would be well to look into this matter and to provide facilities for lousing. It is true that, so far as one can tell, there is little danger here from typhus and trench fever but relapsing fever might easily be introduced from India or South Africa and indeed the old "Bombay Fever" of Mauritius was almost certainly

Lice.

Relapsing fever.

Typhus fever. a form of relapsing fever. Moreover the prevalency of typhus fever amongst natives of South Africa, more especially in Natal, cannot be wholly disregarded. If any case lice are a fruitful source of skin disease and irritation and a campaign against them is distinctly indicated. Here the steam sack disinfectors—above mentioned—will be found of special value.

Flies. War must also be waged against the flies which can certainly be classed as vermin. There are various methods of destroying them which need not here be mentioned but as the chief thing to be done is to suppress breeding-places improvement may be expected when Port Louis becomes a clean town.

Cemeteries. 11. *Cemeteries.*—The condition of the cemeteries requires attention apart from the question of mosquito breeding-places in them. At the Eastern Cemetery and at Bois Marchand I have a suspicion, from certain olfactory evidence, that the process of interment is not all that could be desired. Attention should be directed to the possibility of overcrowding and of faulty burial. It appears that the Bois Marchand Cemetery drains into the Bathurst Canal, a very undesirable occurrence, but the water of the Canal is so polluted that such drainage is not likely to make it much worse.

Miscellaneous. 12. *Miscellaneous.*—There are few other matters which merit attention and are perhaps better classed under this heading:

Lighting. (a) *Lighting.*—A dark town is apt to be a dirty town, in more than one sense, and certainly the lighting of Port Louis leaves much to be desired. This is a matter of hygienic importance, hence the allusion to it.

Civil Prison. (b) *Civil Prison.*—The prison was found to be kept in an excellent sanitary condition. Attention was directed by Major Tremlett to the fragments of broken bottles surmounting the walls. An inspection was made and those likely to hold water are to be removed or broken. An experiment is being made in the way of substituting a storm board for a rain gutter. Of more importance is the question of establishing a Quarantine Block in the prison. Although in the past there does not appear to have been much trouble caused by its absence it will readily be understood that in all prisons it is advisable to have a section where prisoners newly admitted can be under "surveillance" for a short time in case they are in the incubation period of some communicable disease. For example, it greatly upsets the prison work if complaints like scabies, chicken-pox and measles gain a footing while much more serious results might occur in the case of influenza or relapsing fever. The matter is under the consideration of the Inspector General of Police.

Return of sickness amongst Warders. The attached return, kindly given me by the Inspector General, is of considerable interest and value, as, even if the diagnosis of malaria is not in all cases reliable, it indicates the large amount of disability caused by preventible disease in Port Louis, even amongst a picked body of men.

RETURN SHOWING THE ABSENCES OF WARDERS AT PORT LOUIS PRIS NS ON ACCOUNT OF SICKNESS IN HOSPITAL AND AT HOME FROM 20.4.1920 TO 19.4.1921 (INCLUSIVE).

Case	No. of Absences	Diseases
1	68	Malaria and Gastritis
2	18	Malaria and Influenza
3	12	Orchitis
4	3	Gastritis
5	58	Malaria, Influenza, Operation
6	3	Malaria
7	47	Hæmoptysis
8	34	Enteritis, Hepatitis, Malaria
9	15	Malaria
10	26	Malaria
11	15	Scabies
12	5	Malaria
13	18	Malaria, Adenitis
14	7	Malaria, Contusions, Fever
15	4	Malaria
16	8	Gastritis
17	12	Malaria, Influenza
18	16	Itch, Influenza
19	60	Adenitis
20	4	Malaria
21	2	Cystitis
22	6	Malaria
23	33	Inguinal Adenitis
24	7	Malaria, Influenza
25	6	Gastritis
26	14	Inguinal Adenitis
27	13	Gastritis and Influenza
28	8	Fever and Gastritis
29	4	Influenza
30	13	Malaria and Gastritis

—599

Sanctioned No. of Staff	...	33
Percentage of Staff sick	...	90.9
Yearly average of absences per sick warder	...	20 days.

*The disastrous results of sickness are also shown in the case of schools. See Appendix III.

(c) *Civil Hospital*.—I propose to deal with hospital questions separately and here would only say that, as Dr. Rouget has pointed out, it is very desirable to have a proper out-patient department. I mention this matter here because such a department would aid in the recognition of communicable diseases and so have a bearing on the general health of the community. Civil Hospital.
Value of out-patient department.

(d) *Seamen's Home*.—This useful institution has recently been greatly improved. Some suggestions have been made regarding it. Mosquito nets should be provided for the use of its inmates. Seamen's Home.

(e) *Firemen's Barracks*.—These were found clean and in a sanitary condition. Apparently they do not harbour bed-bugs. Here also mosquito-nets should be available and their use and repair should be made matters of discipline. I have written to His Worship the Mayor on this subject. Firemen's Barracks.

(f) *Waste Areas*.—These abound in and around the town and are a source of nuisance. Until there is efficient inspection and good sanitary control little can be done. It will be necessary to clear certain spots covered by long grass, bushes, cacti, etc., and to enclose others. A map should be prepared showing all waste areas and indicating those on which ruined buildings are situated. The latter afford shelter for all kinds of nuisances and should be removed. The practice of growing eucalyptus trees on unclaimed areas should be discontinued. These trees afford shelter to mosquitoes. Waste Areas.
Ruinous buildings

(g) *Concentration of the Town*.—This is a measure advocated long ago by Chadwick. It is very necessary and can to some extent be realized if the clearing operations mentioned in connection with anti-malarial work are put into force. It can only be secured by degrees, and is so intimately bound up with the reconstruction scheme mentioned under Section 2 of this Report that no more need here be said regarding it. Town concentration.

(h) *Stray Dogs*.—These are much in evidence and, even though rabies does not exist, are a source of trouble. They prowl about the markets, they are often diseased and it is possible that they may transmit certain complaints. Stray dogs.

I understand poisoning measures are in force. It would be better to establish a small lethal chamber. This can easily be done, the fumes of charcoal being utilized. Such a chamber costs very little and is merciful and effective. Lethal chambers.

13. *Communicable Diseases*.—I had intended saying something as regards certain of the commoner communicable diseases, apart from malaria, found in Port Louis as for example dysentery, enteric fever, rat-plague, leprosy, venereal complaints and tuberculosis (question of tuberculosis dispensary, &c.) but this report has already attained such dimensions that it would appear desirable to relegate these considerations to a future communication. Communicable Diseases.

In conclusion I would express my indebtedness to Dr. Momplé, the Acting Director, Medical and Health Department, and to Drs. Keisler, Castel and Barbeau for the help and information they have freely given me and which have been most useful. My thanks are also due to His Worship the Mayor of Port Louis, who has taken much interest in the enquiry and has done his best to remedy the defects to which his attention has been directed. Acknowledgment.

I have the honour to be,

Sir,

Your obedient servant

ANDREW BALFOUR.

APPENDIX I.

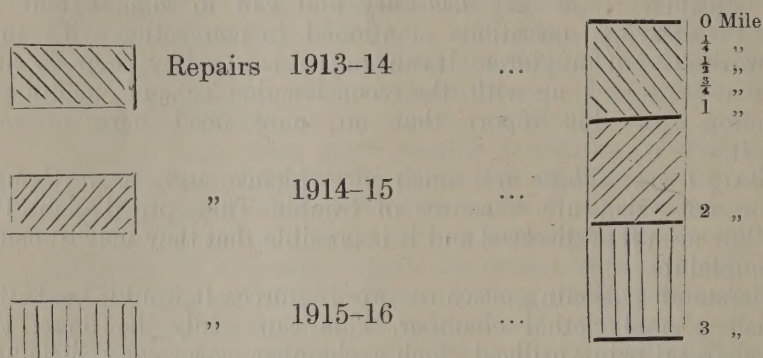
SANITATION OF MOFUSSIL BAZAARS BY G. W. DISNEY

CHAPTER III

ROAD MAKING

One of the most important points towards obtaining a good laid metalled road is to ensure a proper foundation for the metal to be consolidated on, and to see that the sides are well confined or tied in. Where bricks are used for this foundation they should be whole ones, not bats, be tightly packed together and then rammed with a wooden rammer. The edging should consist of bricks-on-end well backed up with earth on the out or berm side. The same applies where stones is used for the soling. These must have flat surfaces, be of fair size, and be well hand-packed together and rammed. It is not much use doing metalling work on a raised road until the embankment has at least 2 rains over it to properly consolidate it. This equally applies to the approaches to bridges on a kutchra road where the metalled portion should be extended to a length of at least 10 feet beyond the toe of the approach slope.

Stone Metal.—In most municipalities it is financially impossible to thoroughly repair all the roads each year, nor is it necessary to do so, if the work has been properly done. A system of biennial or triennial repairs should therefore be evolved. A diagram showing how this can be arranged is shown below.



In the selection of stone metal it is of great importance to see that stone of equal grade and harness is used, and that surface, or weathered rock is not mixed up with the harder material lying underneath it in the quarries. The stone should be broken to the size that the largest piece shall pass freely through a $1\frac{1}{2}$ " diameter ring. When repairing existing metalled roads it is essential that all old metal be picked up, and any rounded, or traffic worn portions re-broken, as it is impossible to ensure good consolidation unless the edges and corners of the stone metal be sharp. Consolidation should be done by a heavy roller. A steam roller for preference. The cost of a 6-ton steam roller is about Rs. 6,000* and the working cost about Rs. 4 per day but this must necessarily vary considerably in different localities, depending on the cost of fuel and labour

FOR OILING ROADS

Oiling roads.—The roadway must first be swept clear of dust and foreign material when the mixture composed of one part of coal-tar to 20 parts of oil(liquid fuel), mixed cold must be sprinkled on through a watering cart. Men with hard long-handled brushes follow the cart, and brush the mixture into the roadway, and repeat this operation for the second time in the reverse direction, when $\frac{1}{4}$ of a mile has been done. The oiling lasts for about 2 months, and costs about R. 1 per hundred square feet.

Tar-Macadam.—Although Tar-Macadam may be somewhat ambitious for mofussil municipalities, an abstract of the specification for Mac-Cabe's tar-Macadam which was kindly supplied to me by the Chief Engineer of the Calcutta Corporation, is of interest, (see Specification Annexure). The cost of a road so laid is Rs. 2-2-0 per square yard, and although sufficient experience is not available to predict its life, some has been done for 3 years and is still good. The materials consist of two parts Pakoor Stone metal, Mac Cabe's patent Bituminous binder of Gas Co.'s coal-tar and "Stag" brand English coal-pitch, in the proportion of 1 of tar to 3 of pitch by weight, with stone chipping, and sand as a top binder.

Kunkar metal.—All *kunkar* metal required for metalling or repair work should be collected, screened and stacked by the middle of May at latest, screening must be done in the

*Pre-war price. A B.

dry weather, otherwise the meshes of the screen soon clog up when the *kunkar* is damp, and the operation more or less a farce. A specification of this is given below :

(1) All *kunkar* must be washed, cleaned, and screened during the dry weather months ; and must be of such quality that, being re-washed and re-screened through an expanded metal screen of $\frac{3}{8}$ " mesh, set at an angle of 45° , shall leave a residue of 80% pure *kunkar*. If *kunkar* of a lower standard is stacked it must either be rejected, or the cost of bringing the metal up to specification, deducted from the price paid.

(2) No *kunkar* should be measured after the 1st June. All *kunkar* collection must be completed by the 15th May.

Brick Metal.—Brick metallised roads are rarely successful owing to the difficulty of ensuring that the metal is of equal hardness throughout, and especially so in a dry climate, as, under heavy traffic, the metal soon wears into brick dust, which either blows away in the dry season in the form of dust, or is washed away in the rains ; on no account should *jhamra* or vitrified brick, and red brick metal be mixed, as their degree of hardness is so different.

It is of great importance that excessive slope be not given in morhum or kutchra roads, otherwise they will rapidly gutter during heavy rain. A rise of 1 in 50 to the centre of the road will generally be found to be ample.

Stacking Metal.—In order to control the collection of material it is essential that all be stacked to gauge, or in boxes, and that the stacks be of equal size, thus facilitating measurements.

Consolidation of metal.—Consolidation of metal must invariably be done as soon after the rainy season sets in as possible, and especially so for *kunkar*. Any heavy rainfall in a water-bound road after the metal is once laid is invaluable in helping consolidation, as it fills up all the interstices which may be left after rolling or ramming ; *kunkar* should be consolidated by ramming with heavy wooden rammers, although on a new road a roller will be of use in forcing the *kunkar* in between the joints of the soling bricks, and jamming them into the earth, thus making a solid foundation. A plentiful supply of water should be used in the process of consolidation ; this is most essential. Stone and brick metallising should be consolidated by heavy rollers, a minimum quantity of surfacing material being used. It is of great importance to keep the berms well made up against the metallised portion of a road, otherwise the metal will rapidly spread out under the traffic.

In all cases it is of the greatest importance that the natural aid afforded by climatic conditions be utilised in making roads ; this is a subject the importance of which is frequently overlooked. When the consolidation of metal is seen to be going on after the end of the rains, unless there are exceptional circumstances to justify this, the official in charge may be condemned at sight as being ignorant or incompetent.

Long lengths of road should not be taken up for repairs at a time, as this causes much inconvenience to traffic. A furlong is the uttermost limit admissible.

ANNEXURE

CORPORATION OF CALCUTTA

SPECIFICATION AND CONDITION FOR SURFACING ROADS WITH MAC CABE'S TAR-MACADAM

Materials

MacCabe's tar-mac consists of 2 inches Pakoor stone metal, MacCabe's patent bituminous binder of Gas Co.'s coal-tar and "Stag" brand English coal-pitch in the proportion of 1 of tar to 3 of pitch by weight, with stone chippings and as a top binder.

Preparation of the Foundation

2. Prior to resurfacing and old stone road with the composition all irregularities in its surface, gradients or crow-fold should be corrected, and special care taken to rectify defects, if any, in all its drainage and water adjuncts, and also to remedy any weakness in the foundation due to bad restoration by the road cutting agencies.

Rules for surfacing Roads

3.—(1) Collect all necessary aforesaid materials including tools and implements for laying them *in situ*.

(2) Sketch out the road area to be treated in convenient sections.

(3) Suspend road watering on the previous day in the section to be treated first and barricade or fence it off.

(4) Thread out the area to be treated with the patent composition as this will avoid feather edge in the centre tar-mac joint.

(5) Form separate gangs for :

(a) Weighing, mixing and heating pitch and tar—three men for each tar-heating boiler or cylinder.

(b) General cleaning and sweeping with rough country or English bass brooms, and removing fine dust off the road surface before treatment by means of soft floor brush.

(c) Carrying pitch and tar composition in pails or buckets and laying it hot half inch thick on dry and clean road surface.

(d) Carrying stone metal in cane baskets, spreading and hand-packing the same carefully to the required chamber, and man for every three feet of road width to be so treated.

Rolling

4. The work of rolling the surface should be commenced as soon as a section of about 20 or 30 yards in length has been laid, the metalling gang being kept as busily employed as possible in laying a further length of materials in the way specified above. The prepared road surface is to be rolled with a light six or seven-ton roller when the composition is soft, as it is absolutely necessary to press the aggregate gently down into the bituminous sub-binder, and at the same time to entice (rather than to force) the latter in an upward direction, so as to fill the voids in the metal and finally cover the metallised surface. Under no circumstances should the rolling be carried to such a point that the metal exhibits signs of crushing or disintegration. The roller should be driven over the newly laid materials at its lowest speed from the side towards the centre and after a few journeys over the surface, if it is found that the sub-binder is not working up between the voids in the metal and does not cover the metal surface, then such defective places have to be painted and the whole surface sealed with composition to prevent the admission of moisture or any foreign substance into the road. During the process of consolidation stone chippings at the rate of 4 cubic feet per 100 square feet should be used and especially where the floated composition is too soft. If it is found that any material sticks to the roller wheels a little water sprinkled on the wheels will at once stop the sticking. The dry surface may be also sanded if it becomes slippery for horses.

5. All materials to be supplied must be to the satisfaction of the Engineer. Inferior materials supplied shall be rejected and the contractor must make good such supply within 24 hours. In default it shall be competent for the Engineer to procure a supply of the same at the risk and cost of the contractor from the market or any other agency.

6. The contractor must maintain the roadway for three months after completion, and keep men in attendance to promptly spread stone chips and road dust on the soft portions and nurse the area cut by the traffic.

7. The contractor must be careful not to injure existing gas, water or any other pipes or drains or other underground fixtures. Any damage so caused must be forthwith reported to the District Engineer, and the contractor shall make good the same forthwith at his own cost and shall indemnify and keep indemnified the Corporation from all claims made therefor. When necessary he shall take up and carefully relay drains and pipes and lay any additional length that may be ordered by the Engineer at the cost of the Corporation.

8. The contractor must keep the work properly fenced and lighted from sun-set to sunrise, and place such watchmen at any portion of the road and footpath in which the work is in progress and is still incomplete, and also round the repairing materials for use, as may be necessary to protect the public against accidents. He shall indemnify and keep indemnified the Corporation and its officers and servants from all liability in respect of any claims for damages or otherwise to person or property which may be made by any person or persons on account of any act, misfeasance or neglect on the part of the contractor in carrying on the work or in connection therewith.

9. The contract will be for four months and the contractors must carry out all works in accordance with the full programme of work prepared by the Engineer and take in hand such street or streets as the Engineer may direct and complete the same within such period as the Engineer may fix therefor. In default he shall pay to the Corporation liquidated or settled damages of Rs. 10 (ten) per diem for each and every day beyond the said period without prejudice to the rights of the Chairman to cancel the contract and take possession of the work and have it carried on and completed at the contractor's risk and cost by any agency whatever.

10. All damages or other sums due and payable by the contractor may be received from any moneys due to the Contractor by the Corporation.

11. Payments will be made in accordance with the terms of the agreement.

12. The Commissioners do not bind themselves to accept the lowest or any tender, but reserve the right of accepting the whole or part of the tender.

APPENDIX II.

WATER DISINFECTION BY LIQUID CHLORINE.

Liquid chlorine is one of the cheapest, most conveniently handled, and most effective disinfectants for the purification of water supplies. It is chlorine gas, of 99.9% purity liquefied under pressure and stored in steel cylinders containing 70 to 100 lbs., and effects the sterilisation of water supplies of average impurity when added in the proportion of one-third part per million, by weight. The active germicidal agent is the nascent oxygen resulting from the decomposition of the unstable hypochlorous acid produced on the addition of chlorine to the water.

To Lieutenant Nessfield, of the Indian Medical Service, is due the credit for first publicly suggesting (in 1903) the use of liquefied chlorine gas for the sterilisation of water supplies. Major Darnall, of the U.S. Army Medical Corps, put this suggestion into practical form in 1910. Various improvements have lately been effected on the mechanism for regulating, measuring and applying the chlorine with precision.

The "Chloronome" is the registered name of the Paterson Engineering Company's device for regulating, measuring and administering chlorine gas to water supplies. Figure 2* shows in outline a typical arrangement of the apparatus capable of sterilising up to 3,000,000 gallons daily.

The liquid chlorine is contained in steel cylinders, each holding about 70 lbs, the pressure at 32° F. being 54 lbs. per square inch, or at 120° F. 215 lbs. per square inch. It passes into the gaseous form on evaporation by the heat abstracted from the atmosphere through the walls of the cylinders.

The steel cylinders are usually placed on a weighbridge to check the amount of chlorine used during long periods, and to indicate when the cylinders are nearly exhausted. A coil connector valve is coupled up to the valve on the cylinder head. The chlorine gas is led through a flexible connecting coil of copper tube to the filter which removes any slight deposit which may be carried by the gas from the exposed coil tubes or the cylinder fittings. As it is important that the pressure of gas be kept constant on the regulating valve, two pressure reducing valves are arranged in series. The chlorine gas at a pressure varying from 80 to 120 lbs (depending upon the temperature of the surrounding atmosphere) passes through the first reducing valve which breaks down the pressure to 20 lbs. per square inch, then through the second reducing valve which maintains a constant pressure of 10 lbs. per square inch on the regulating valve. Should this pressure, as indicated by the gauge, show a tendency to drop, the attendant knows it is time to switch on the second cylinder. By the application of artificial heat it can be assured that the first cylinder is completely exhausted before being replaced by another to be put into commission at a later date when the second is practically exhausted. The chlorine gas passes the regulating valve and flows from the meter (detailed reference to which is made later) through a central pipe down to nearly the bottom of the absorption tower. This glazed earthenware tower is fitted at the top with a water distributing tray and packed with pumice. A small trickle of water is uniformly distributed over the pumice, and in its downward flow absorbs the measured quantity of chlorine gas. The chlorinated water flows from the bottom of the tower through a chlorine-resisting rubber or earthenware pipe, and is uniformly distributed through the main body of the water to be disinfected.

Many water supplies can be chlorinated by the addition of a quarter part per million, *i.e.*, 2.5 lbs. of chlorine per million gallons of water purified, so that an installation purifying 1,000,000 gallons per day, may only require to administer 1.66 ozs. of chlorine per hour. Even with plant of this moderate capacity it is desirable to have a positive volumetric measurement of the gas administered, and absolutely essential when dealing with smaller plant of, say, 1,000 gallons hourly requiring .041 ozs. of chlorine.

Dry chlorine gas at normal temperatures has no appreciable corrosive effect on metals, but immediately it comes into contact with the moist atmosphere most virulent corrosion takes place. The special feature of the Paterson "Chloronome" is the interposition between the instrument and the absorbing water supply of an isolating column of liquid which is unaffected either by the gas or the water absorbing it, and acts as a volumetric meter. Tests were carried out with various liquid seals and ultimately sulphuric acid was selected as the most effective. The sulphuric acid is contained in a "U" shaped sealing tube. The flow of gas depresses the column of sulphuric acid until it unseals a small vent pipe which then permits the passage of the measured quantity of gas from the inlet to the outlet limb. This establishes equilibrium and permits the return of the column of sulphuric acid until it again seals the vent pipe, when the cycle of movement is completed and another downward stroke commences. The gas is maintained at 10 lbs. pressure on the regulating valve, but is measured by the volumetric meter at atmospheric pressure. The rate of pulsation and known volume of the stroke gives the weight of chlorine added. Prolonged tests have shown that when the regulating valve is once set, the meter continues to pulse for months at the same rate. By means of the stop valve below the pressure gauge, the attendant can stop and start the apparatus when required without readjusting the regulating valve.

*Figures not reproduced.

Advantages of Liquid Chlorine.

The advantages of the liquid chlorine over hypochlorite of lime, or "bleach" are:—

1. Liquid chlorine is the pure concentrated germicidal agent which can be stored indefinitely without deterioration, while the hypochlorite has only 33 per cent. available chlorine, and deteriorates rapidly on exposure.

2. Liquid chlorine occupies very much less space and can be more conveniently handled than hypochlorite of lime.

3. Liquid chlorine reduces the labour costs of sterilisation to a minimum.

4. Two cylinders of liquid chlorine when connected to a "Chloronome" may continue to sterilise a total of 60,000,000 gallons of water of average impurity without further attention while the hypochlorite has to be pasted, made into solutions of standard strength, titrated once or twice daily and drawn off through regulating devices.

5. No sludge residue results when applying liquid chlorine. Sometimes the disposal of the sludge, resulting from hypochlorite treatment, is a troublesome matter.

6. A much greater precision of the dose of chlorine is possible with the "Chloronome" than with any other form of apparatus.

7. The administration of a precise volume of germicidal agent of known uniform strength practically eliminates the possibility of accidental overdose.

8. The initial capital outlay and the continuous labour costs are much less with the "Chloronome" than with hypochlorite plant.

From every point of view, the substitution of liquid chlorine plant for hypochlorite of lime, or bleach, effects a marked economy in initial capital outlay, labour and continuous running costs, and greatly improves the working conditions and results obtained.

"Chloronomes" are in successful operation in this country for capacities ranging from 50,000 to 40,000,000 gallons per day, including those for the Metropolitan Water Board and other important authorities.

APPENDIX III.

SCHOOL ABSENCES

In the course of school inspections in Port Louis I found that a large number of children was absent owing to illness. Accordingly a request was made for a return showing, for the period of one year, the average monthly attendances both at Government and Aided Schools. This was duly furnished and is here produced. It shows, on the whole, a very unsatisfactory state of things though it should be noted that sickness is not always the cause of absence. I understand that poverty plays a part—while, at certain periods of the year, parents send their children out to work. Still there can be no doubt that illness, in most cases, preventable illness, has much to do with these frequent absences, and that it interferes greatly with the development and education of children in Port Louis. At a moderate computation it must cause from 15 to 20 per cent. of absences.

GOVERNMENT SCHOOLS

SCHOOLS	NUMBER ON ROLL												AVERAGE ATTENDANCES											
	1920												1921											
	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March
Champ de Lort ...	362	397	411	386	406	436	412	414	410	390	431	446	234	262	265	268	284	300	304	294	217	256	267	250
Eastern Suburb B. & G.	186	195	205	200	206	217	211	211	211	165	201	207	% 64	65	64	69	69	68	73	71	52	65	61	56
Eastern Suburb Infants	165	177	187	170	165	178	170	168	169	158	176	175	% 122	116	144	150	151	149	147	143	163	120	128	130
Vallée des Prêtres ...	120	120	123	112	115	116	112	114	115	115	126	133	% 65	59	58	74	76	75	74	84	76	71	72	61
Western Suburb	294	313	332	331	333	323	334	316	315	330	350	364	% 63	61	67	79	86	85	84	72	86	86	94	97
Men's Training	470	470	492	517	483	483	449	459	457	459	399	401	% 52	70	64	70	74	73	75	63	74	74	72	72
Women's Training	212	218	222	225	180	225	221	216	214	192	210	203	% 194	115	215	244	253	254	254	161	298	232	213	208
													% 308	68	61	75	76	78	76	82	94	70	60	57
													% 65	60	60	63	69	69	55	52	53	43	58	66
													% 152	74	72	76	169	186	133	135	121	113	142	135
													% 71	74	72	76	13	82	60	62	56	58	67	66
													% 64	64	63	71	76	73	69	69	65	65	63	68

Monthly Average attendances of all Government Schools in Port Louis

AIDED SCHOOLS (PRIMARY)

SCHOOLS	NUMBER ON ROLL												AVERAGE ATTENDANCES											
	1920												1921											
	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March
De la Salle ...	349	390	411	391	411	430	394	409	410	360	409	426	250	269	277	301	280	290	179	306	323	246	241	263
Immaculée Conception	182	196	208	218	208	225	239	255	229	227	232	247	% 71	68	65	76	68	67	45	74	45	68	58	61
La Paix Street	189	208	221	193	199	218	193	201	201	167	189	192	% 115	124	128	142	146	151	158	171	172	148	150	149
N. D. de Bon Secours	210	228	251	223	245	262	231	238	242	219	237	248	% 63	63	61	65	70	67	66	67	75	65	64	60
N. D. de Lorette	246	257	269	255	262	276	253	259	259	178	216	230	% 129	141	133	143	139	141	133	135	154	106	116	77
Père Laval ...	122	124	130	134	135	141	142	143	126	99	114	119	% 68	67	60	74	69	64	68	67	61	63	61	40
Ste. Croix ...	73	80	81	74	72	76	72	75	77	68	75	75	% 139	147	158	171	166	159	141	161	185	139	126	146
St. Joseph ...	270	321	337	324	331	354	316	322	322	289	323	338	% 160	160	151	163	155	164	175	138	138	116	138	121
Signal Mountain	230	225	240	236	251	262	251	229	223	218	234	238	% 65	62	56	63	59	59	53	53	66	63	62	62
Soonee Soortee	252	133	124	139	160	163	175	175	180	170	175	181	% 79	80	84	74	76	75	82	82	89	59	76	70
													% 64	64	64	55	56	53	57	57	70	59	66	58
													% 62	60	68	68	66	64	62	70	76	47	61	63
													% 84	75	83	91	91	84	86	93	98	69	81	84
													% 181	201	205	239	186	213	217	226	251	183	188	163
													% 67	62	60	73	56	60	68	70	77	63	58	43
													% 131	132	131	152	157	162	154	162	188	140	129	116
													% 56	58	64	64	62	61	61	70	83	64	55	48
													% 156	74	79	95	108	106	106	120	145	88	101	98
													% 61	55	63	68	67	65	60	68	80	58	57	51
													% 66	63	63	70	66	64	64	68	71	63	61	56

Monthly Average attendances of all Aided Schools in Port Louis

